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VIEWS, NEWS AND INTERVIEWS.

"Them electrical fellers is goin' ter make us work fer 'em," bubbled the Water Fall to the Brook. "Well, I'll be dammed!" babbled the Brook.

What is said to be the largest sawmill in the world is operated by electricity at Port Blakely, Wash. The whole plant is lighted by electricity, and at present the mill is running night and day, with three shifts of men for the 24 hours. Electricity is also used for motive power in the planing and finishing departments and in the blacksmith and pattern shops. Their lathes, planes, moulding, and pattern workings are so complete that they are enabled to supply any portion of disabled machinery at short notice, and last year furnished 50 tons of castings for their own repairs. The company also owns and runs a gristmill for a supply of the logging camps, a hotel for visitors, a hall for public meetings and church purposes, and a town of some 200 houses.

A prisoner confined in the state prison at Trenton, N. J., recently made an elaborate attempt at escape, which was frustrated by means of the prison searchlight. The man had succeeded in cutting his way out of his cell to the roof of one of the main buildings. When he finally arrived on the roof he saw that the searchlight, located at one corner of the wall, was turned so that its rays illuminated the whole roof. This made it impossible for him to slide down an improvised rope with which he had provided himself. He spent the night hiding in the shadow of the ventilator and the following morning his absence was discovered and he was recaptured.

Those who believe that a naval officer's life in times of peace is one of ease will undoubtedly change their views after reading the following experience as told by a well known officer in the United States navy:

"I am glad to see you again and all the more so, because, without knowing it, I came very near going up into the air in small bits on this last squadron cruise. We were at heavy gun practice at sea, and but for the quickness of a gunner's mate would never have returned. As you probably know, the heavy guns in the turrets are fired by electricity, the gun being discharged simply by pressing a button. The officer in command of the forward turret on our ship during rapid-firing practice was just about to press the button to fire one of our big guns, when a gunner's mate was seen to grab at something on the wall of the turret and then fall in a heap on the floor. The officer pressed the button, but the gun was not discharged. When the mate came to he was asked what had happened, and he informed the officer that the breech of the gun had not been locked and that what he grabbed at on the wall was the wires forming the electric firing circuit. When he saw that the officer was prepared to fire the gun and at the same time observed that the breech of the gun was not locked, the only thing that occurred to him to prevent the gun being discharged was to destroy the circuit, which he did promptly and effectively. When all this occurred there was a charge of 250 pounds of powder in the gun, another charge of the same size in the turret ready to be served, and the passageway leading to the powder magazine was wide open. But for the quickness of the gunner's mate, the gun would have been discharged, the breech block would have blown out inside the turret, the gases from the burning powder would probably have ignited the charge lying in the turret, this explosion would have ignited the powder in the magazine, and the chances are that the whole ship, crew and all, would have gone up in the air. A thought that has occurred to me is this: Suppose the accident had occurred, what do you imagine the verdict of a board of inquiry as to the cause of the loss of the ship would have been? Since this experience the department has adopted electrical means to prevent the discharge of any of the large guns until the breech is locked."

Fig. 1.—Winding and Testing Room in the Plant of the American Electric Telephone Company.

"Do you know," observed a man with a bulging forehead, at the Niagara Falls Edison convention, "that there is just about enough coal mined daily in all the world to furnish sufficient steam power to pump back the water running over Niagara Falls?" No one disputed the calculation, but all gazed with awe upon the calculator.

A Busy Telephone Factory.

Prominent among the independent telephone manufacturers, the American Electric Telephone Company, of Chicago, is, at the same time, one of the most active and progressive in the field, although it is but a few years since Mr. P. C. Burns started in a comparatively small way, at Kokomo, Ind., the manufacture of high-grade independent telephone and exchange apparatus. It was not long before the business outgrew its old quarters, and in the beginning of the present year two entire floors of the Springer Building, 171–173 South Canal street, Chicago, were secured and the factory moved, advantage being taken of the change by adding a complete line of improved time and labor-saving machinery to the workshop equipment.

The labor payroll now shows some 95 hands as being regularly employed, and is rapidly increasing. An office force of 12 people is required to attend to the various details of orders, correspondence, etc. Nearly 16,000 square feet of floor space is covered by the two floors, and the factory is fully equipped to turn out all the necessary appliances required in central office, private line or exchange equipment. Our illustrations show several views of the works, and give a good idea of the magnitude of the concern. Fig. 5 shows a view of the front part of the general offices, Manager Dodge being shown in the foreground. The office is, of course, fully equipped with interior, local and long-distance telephone instruments, Postal Telegraph office, messenger calls and all time-saving accessories.

In Fig. 2 the assembling of switchboards and transmitters is shown to good advantage, while in Fig. 3 a corner of the machine shop is shown, where the heavier work, as well as the tool-making, is done. Fig. 4 shows another part of the machine shop, devoted to the manufacture of the magnetos, bells and other signaling apparatus. Fig. 1 shows a corner in the winding and testing-room, while in Fig. 6 is shown the final assembling and packing of the finished apparatus. It is interesting to note that since

the beginning the company has been steadily growing and extending its business, until to-day American apparatus is in use in every State in the Union and in a number of foreign countries. The highest testimonials regarding the company's new express type switchboard with self-restoring drops are received almost daily, and the company is constantly adding new and improved details. Among its latest

FIG. 2.—ASSEMBLING SWITCHBOARDS AND LONG-DISTANCE TRANSMITTERS, AMERICAN ELECTRIC TELEPHONE COMPANY.

novelties may be mentioned the new carbon lightning arrester, which seems to be meeting with universal favor among the exchanges. The officers of the company are P. C. Burns, president; H. C. Dodge, general manager; Paul W. Bossart, secretary; S. W. Moon, auditor; W. O. Meissner, superintendent of factory.

The Trolley in Cairo, Egypt.

The electric tramway in Cairo was opened for traffic on August 1, 1896. It was constructed by the Union Elektricitäts-Gesellschaft, of Berlin, on the well known Thomson-Houston overhead system, says London *Lightning*. The installation comprises 10 lines, aggregating 23 kilometres, of which about 17 kilometres are double-track and the rest single-track—metre gauge. The trolley wire is suspended by means of span wires made fast either to ornamental rosettes on the houses or to tubular steel poles within the limits of the city, while outside creosoted wood poles are used.

There are at present in service 40 motor cars and 20 trailers Each of the former is equipped with two motors of the G. E. 800 type, and is capable of drawing two trailers. On account of the mild climate, all the cars are open. Each is divided into three compartments, one for natives, another for Europeans, and the third for the women of the Harem.

The power station is situated near the Nile. The boiler house has an area of 183 square metres, and is planned to hold five boilers. For the present there are three Cornish boilers (Tosi system), having a heating surface of 110 square metres, and working at a pressure of 10½ atmospheres. The steam piping is arranged on the ring system, and allows of any one of the boilers working with any one of the engines.

The engine-house has an area of 430 square metres, and will hold five generating sets. There are at present three horizontal compound engines with automatic cut-off, Tosi system, for a working pressure of eight atmospheres. The speed is 120 revolutions; maximum capacity, 400 British horse-power.

Under ordinary conditions the engines work surface condensing. The condensing water is taken from a reservoir close to the station by means of three centrifugal pumps (one of which is a spare), each coupled direct to an electric motor. The reservoir is fed by a canal leading to the Nile, but the water is first passed through a filter, in which it is freed from the considerable amount of sand that it holds. Special care had to be taken with this installation, in view of the varying height of the Nile. A portion of the condensing water, after removal of oil and dirt, is used for feeding the boilers. Each of the engines drives direct a railway generator having a capacity of 225 kilowatts at 500 to 550 volts. Near the power station is the car shed and repair shop. The former is furnished with cleaning pits and all arrangements for proper care of the cars, while the repair shop is equipped with all necessary tools for the execution of ordinary repairs. A second car shed has since been built at Abassieh. The line is owned and operated by the Société Anonyme Chemins de Fer Économiques, of Brussels.

A New Electric Light Company in New York City.

The Borough of Manhattan Electric Company, to furnish electricity for lighting, heating and power purposes in New York city, was incorporated on September 22, with a capital of $100,000. The directors are Charles A. Lieb, Hugh H. Harrison, Joseph F. Darling, Albert S. Williams, Charles P. Blaney, Robertson Honey and Edward Schmidt, of New York city.

TELEPHONE NEWS AND COMMENT.

The new State Telephone Company has completed an exchange at Grand Ledge, Mich., with 43 subscribers.

The Detroit State Line Telephone Company will soon commence the extension of its line from Monroe to Adrian, Mich., giving Adrian patrons a rate not to exceed 25 cents to Detroit and 15 cents to Monroe. An effort will be made to connect every post office in the county, and to also place instruments in farm residences.

The Uniontown, Ky., Telephone Company is now an accomplished fact, the organization being completed and perfected. The municipalities of Morganfield and that city will henceforth be united by a free service of electric communication, all subscribers of both local systems being charged nothing for interchange of messages.

The Colorado Telephone Company, of Walsenburg, Colo., has commenced putting in a village system of telephone communication. Connections will be made with all the coal mines, of which there are a number within a radius of four miles. The system starts out with a large number of subscribers, and more are expected when the convenience and advantages are seen.

Representatives of the Home Telephone Company, which desires to establish a system in the city of New Brunswick, N. J., have had a conference with the Streets and Roads Committee of the Aldermen. The Home Telephone Company offers to furnish the city with 12 telephones free of charge, and it is believed that the council will grant the competing line a franchise.

A mortgage deed of trust from the Mason-Maxwell Telephone Manufacturing Company, of West Virginia, to the Maryland Trust Company, of Baltimore, was recently recorded. It is to secure the issue of $25,000 first mortgage gold bonds by the Mason-Maxwell company. The bonds are to be dated December 1, 1895, and are to run until December 1, 1905 bearing six per cent interest. The money will be used by the company to extend its plant and increase its business.

The Home Telephone Company, of Cleveland, is about to be investigated by the City Council, and its relations to the city government are to be ascertained. The Home Telephone Company entered into an agreement with the city to have 600 telephones in use by September 1, 1897, and posted $5,000 as a guarantee, to be forfeited to the city in case it did not have the 600 telephones working by the time named. The company also agreed to place a number of telephones in the city hall for the free use of the city. None of these agreements has been kept by the company, it is said, and yet the $5,000 was returned to the telephone people when they asked for it.

One of the most ingenious applications of the telephone is the portable form, which is known as the portable hospital telephone. Its particular use is to enable people in a sick room, in which an infectious disease is being nursed, to communicate with the people in the rest of the house. The irksomeness of having some of the infectious diseases in a mild form is multiplied tenfold by the enforced seclusion of the patient, who is suddenly cut off from intercourse with the rest of the family. Now, by the mere addition of the apartment to the furniture of the department, it is possible for a sick person to keep up a conversation with any member of the rest of the family, and in this way the tedium, which is inseparable from the compulsory isolation, may be relieved. Furthermore, the nurse will by its means be saved a good many journeys, even in non-infectious cases.

FIG. 3.—AMERICAN ELECTRIC TELEPHONE COMPANY'S MACHINE SHOP.

Good Idea To Hustle.

"Opporchunities," said Uncle Eben, "is pretty sho' ter come to ebery man. But it's a mighty good idee, jes' the same, foh him ter hustle roun' an' send out a few invitations."

ELECTRIC LIGHT FLASHES.

The Livonia, N. Y., electric light plant has been totally destroyed by fire, at a loss of $2,000. The fire is supposed to have been of incendiary origin.

Ex-United States Marshal J. C. Drake has been appointed receiver of the Tacoma, Wash., Gas and Electric Light Company by Judge Hanford, and his bond fixed at $10,000.

The Nevada asylum is to have an electric light plant, and the contract for erecting it has been let to St. Louis parties for $6,900. The plant will consist of two engines, two dynamos and 1,300 lights.

The promoters of the Mansfield, N. Y., Electric Light Company have awarded the contract for a dynamo and some other supplies for the plant. The dynamo selected has a capacity of 2,000 incandescent lamps. It will be located at the novelty works, arrangements having been made with that concern for the use of their engine and boiler.

All that part of Brooklyn, N. Y., within half a dozen blocks of the bridge, in all directions, was in darkness for about 20 minutes, after 12.30 o'clock one morning last week, owing to the blowing out of a cylinder head of a 1,200-horse-power engine in the plant of the Edison Illuminating Company in Pearl street, near Myrtle avenue. Temporary repairs were quickly made.

W. W. Griscom Killed.

A dispatch from Penetanginshene, Ont., received in New York city on Monday of this week, states that while out rifle shooting on Governor's Island last Friday forenoon, W. W. Griscom, of Philadelphia, who has been spending the Summer with his family at his new Summer residence on Minnicoganashene Island, was instantly killed by the accidental discharge of his rifle. William Woodnuth Griscom was born in 1851 and was a member of a well known Philadelphia family. He was a brother of Clement A. Griscom, president of the International Navigation Company. He was president of the Electro-Dynamic Company and vice-president of the Electric Storage Battery Company.

The Electrical Exposition for 1898.

Ever since the electrical show held in New York city during May, 1896, there has been a feeling in the trade that it should not be the last. Its splendid success in the way of bringing trade to exhibitors has led to a very general demand that it be repeated.

A company has been formed with $20,000 capital and a live, up-to-date board of directors to conduct such an exhibition in 1898. Articles of incorporation were filed in Albany on Wednesday of last week, and these gentlemen were named as officers and directors: Cyrus O. Baker, Jr., president; Ferd. W. Roebling, vice-president; Geo. F. Porter, secretary and treasurer. These officers, with Leonard F. Requa, Charles A. Lieb, J. W. Godfrey and H. H. Harrison constitute the board of directors. Executive committee, C. O. Baker, Jr., Leonard F. Requa and H. H. Harrison. Mr. Marcus Nathan has been selected as general manager.

This practically insures a first-class exhibition. The new electrical inventions and improvements developed since the last show will be an important factor. The interest and co-operation of many manufacturers already assured will count for much towards making this a more complete demonstration of all the applications of electricity and its branches than was possible in the first exhibition in 1896.

FIG. 5.—VIEW IN THE GENERAL OFFICE OF THE AMERICAN ELECTRIC TELEPHONE COMPANY.

A Big Electric Light Franchise.

The Commonwealth Electric Company, of Chicago, has filed with the City Clerk its acceptance of the ordinance passed by the council June 21 last. Accompanying the acceptance was a bond for $50,000, required under the terms of the ordinance.

Ex-Alderman William Mahoney and Andrew J. Graham, the west side banker, are sureties on the bond.

The acceptance sets forth that the company has been duly organized under the law with William Mahoney as president.

The ordinance gives the company the right to put in an electric plant for the purpose of furnishing light, heat, power and the transmission of sounds and signals covering the entire city. The city is to receive three per cent of the gross receipts of the company after five years as compensation, and is given the right to purchase the plant on an assessed valuation at the expiration of 50 years.

The capital stock of the company is $5,000,000.

Prof. Elihu Thomson on X-Ray Screens.

TO THE EDITOR OF ELECTRICAL REVIEW:

Mr. Elliott Woods, in a letter to you, published in your issue of September 15, puts forward the idea that a metal screen is a preventive of injury by X rays. I do not see that he has made this clear, for the mere absence of injury when a gold-leaf screen was used does not prove that the injury would have occurred if the same intensity of rays for an equal time had been administered without any such screen being used. As offsetting much that Mr. Woods has said in relation to the protective action of metal screens, I have only to say that I bear the scar of an X-ray burn made by a 12-minute exposure through thin aluminum, and that the injury produced through the aluminum was but little less than that which was produced on an unprotected spot exposed simultaneously for the same period.

Of course, a metal screen diminishes the intensity of the rays in a degree depending upon its absorptive power, which differs with the substance of the screen and increases with its thickness. If the X rays which produce injuries are, as seems probable to me, those of the lower order, and which are most easily absorbed by dense materials, then, of course, there may be some benefit obtained by the use of absorptive screens properly selected, especially if these screens tend to cut off the lower order of rays, while allowing an abundance of X rays of intermediate and higher orders to pass through them.

In any case, it seems to me that the interposition of an absorptive metal screen will demand a longer exposure, and unless such screen exerts a selective absorption for the lower rays, or those most easily absorbed by the skin and tissues, it is difficult to see how any special benefit can accrue from its use.

Yours truly,

ELIHU THOMSON.

Lynn, Mass., September 18.

FIG. 4.—VIEW IN MACHINE SHOP SHOWING MAGNETO DEPARTMENT, AMERICAN ELECTRIC TELEPHONE COMPANY.

FIG. 6.—ASSEMBLING AND PACKING ROOM, AMERICAN ELECTRIC TELEPHONE COMPANY.

Well Said.

[From the Barnesville, Ohio, Wheatstone.]

The ELECTRICAL REVIEW is the very first among journals of its class in this country.

Some Wagner Apparatus.

The Wagner Electric Manufacturing Company, of St. Louis, are the manufacturers of the electrical apparatus shown in the accompanying illustrations. In Fig. 1 is shown a self-starting, single-phase power motor; Fig. 2 illustrates a 15-kilowatt direct-current generator, and Fig. 3 represents a feeder switchboard installed in the station of the Southern Electric Railroad Company, of St. Louis.

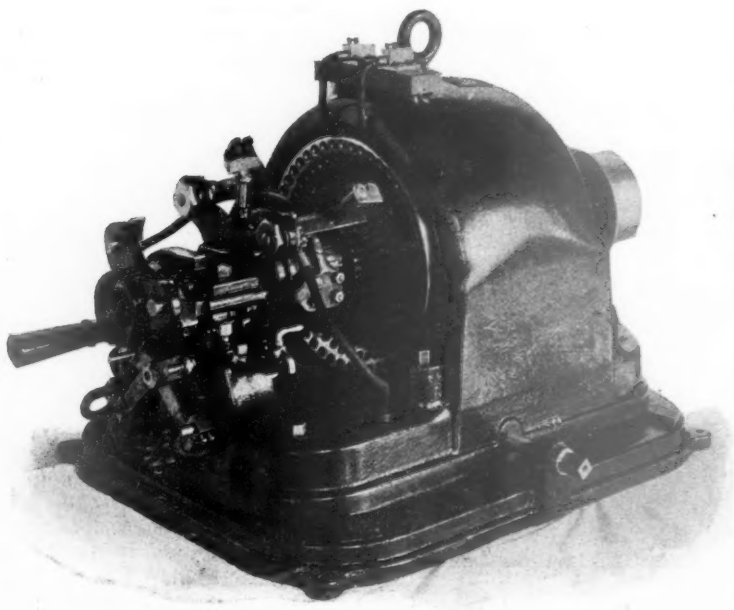

FIG. 1.—WAGNER SELF-STARTING SINGLE-PHASE POWER MOTOR.

The self-starting, single-phase power motor is built on the usual simple principle comprising the primary and secondary elements. The secondary is constructed to operate in a double way. For starting, it is thrown in series with the primary by means of carbon brushes running on a commutator. With this connection the operation of the motor is practically the same as that of a direct-current series motor. On attaining the running speed the connections are changed, the commutator in the operation of changing being completely short circuited and the brushes raised. The motor then runs as a non-synchronous induction motor.

This company's multipolar direct-current generator, as shown in Fig. 2, is a modern and up-to-date machine in every respect. The frames are cast from the best high-grade magnetic iron, and the pole pieces in the larger sizes are separate, being cast from a superior grade of steel. The armature is of the ironclad type, and the armature coils are all machine wound. These generators are compounded to any degree desired. Unless otherwise specified, they are built to over-compound five per cent at full load.

The switchboard shown in Fig. 3 is of the well known panel construction now generally used for both feeder and generator service. The Wagner company is prepared to furnish standard feeder panels for use either in connection with generator or feeder panels of any other standard make or for independent service. These panels are made in a variety of forms, sufficient to meet practically every station requirement that is liable to arise. The panel body consists of black japanned, highly polished slate, two inches thick, which is carried on substantial angle irons permanently fastened to each vertical edge. Bus bars built up of drawn copper sections are carried by heavy cast copper terminals directly on the hinge post studs of the feeder switches. When desired, marble can be substituted for slate as the panel body.

Carborundum vs. Emery.

A German paper states that the question of carborundum vs. emery is attracting attention in Europe. In emery the abrasive material is crystallized aluminum oxide; in carborundum it is carbide of silicon. Although carborundum is much harder, its crystalline structure is less favorable for grinding than is emery. The crystals of carborundum are long and narrow, with few cutting edges and smooth faces, while emery crystals are nearly cubical and have rough surfaces. Perhaps the greater hardness of carborundum is offset by the better cutting properties of the emery. This is also indicated by the difficulty in keeping carborundum wheels from glazing when too much slag is used in making them. The author quoted concludes that emery has the advantage over carborundum for grinding or polishing purposes in all cases except where the finest grades are used. For the latter, carborundum seems to be the better.

The Electric Appliance Company, Chicago, have just completed the distribution of their latest edition of catalogue known as General Catalogue No. 12. Every mail brings them a large number of complimentary letters from their customers and the trade in general from all parts of the country. It is very evident that the style in which their catalogue has been issued is the one that is the most satisfactory to the trade, and the Electric Appliance Company will undoubtedly reap the benefits that naturally come from the exercise of the best judgment in matters of this kind.

TELEGRAPHY WITHOUT WIRES IN GERMANY.

BY CHARLES DE KAY, CONSUL-GENERAL AT BERLIN.

Some years ago efforts were made, with but partial success, to telegraph without connecting wire from the mainland to an island by using the sympathy that is shown by a wire buried in the earth on the island when a charge of electricity was sent through a similar wire buried on the mainland. In some cases faint reactions were noted in the island wire, and it was hoped that by passing and discontinuing the charge through one buried wire the ticks might be registered by the other, and thus a sympathetic telegraphy be perfected.

Large sheets of copper were also tried in place of wire, also wires wound round buried magnets; but it was found that the earth diffused the electricity so much that nothing of practical value ensued. Other experimenters, considering the extraordinary resemblances between the action of electric waves and light waves through the air, sought for means to send electricity through the air itself. This has been accomplished in England by Marconi, whose fame reached America some time ago. But since it may be that no popular description of his method has been published, and since the experiments of Professor Rubens, of Frankfort, instructor in electric physics at the Berlin Polytechnic, have helped to make the method more precise, I venture to send the following report:

Marconi experimented from the British mainland to an island four marine miles distant. He used a generator of electric waves invented by the late Professor Herz, which generator throws the waves of electricity in all directions, as the rays of light emanate on all sides from a flame.

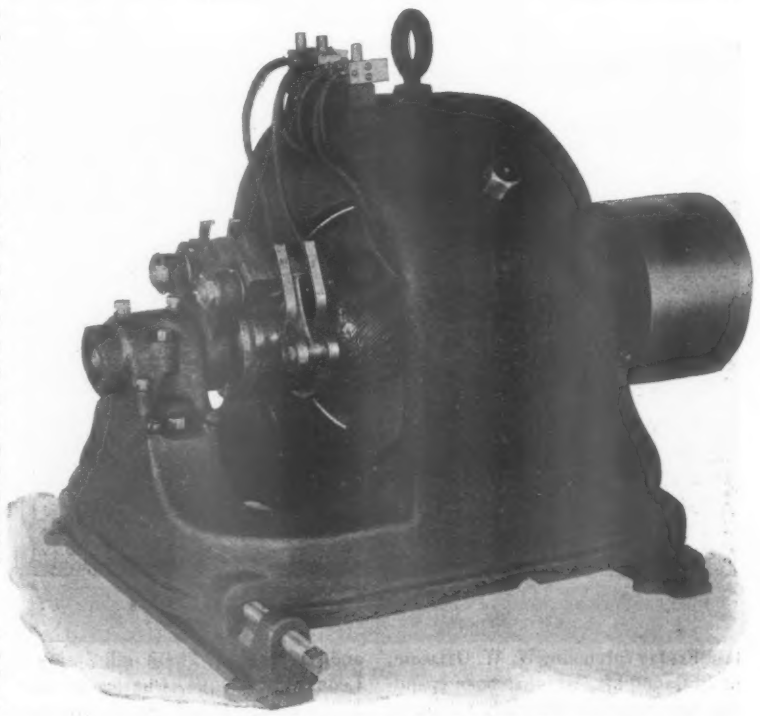

FIG. 2.—WAGNER DIRECT-CURRENT 15 K. W. GENERATOR.

The problem was to concentrate these rays or waves of electricity in one direction; namely, toward the island. This he did by placing a concave mirror behind the Herz generator, by which the waves were reflected and made parallel in the required direction. On the island he placed what is called a "coherer;" that is to say, a tube filled with particles of metal of just the right size and quality for the purposes now to be set forth. The coherer was set before another concave mirror, so placed that it would catch the electric waves coming parallel across the water from the concave mirror and Herz generator on the mainland. The coherer was set exactly at the focus. Imagine that the Herz generator on the mainland is a flame whose light rays are caught by a concave mirror, thrown over to the island, caught there in another concave mirror, and focused on the coherer.

Now, the metal particles in this coherer are so adjusted as to size that the whole may be likened to a violin string, which vibrates when a certain sound is made by the voice.

As one can tune a violin string to a certain note, so one can find the metal particles that will vibrate to an electric wave of a certain size. Try to pass an electric current through these particles at ordinary times and there will be no result; but when the waves generated by the Herz generator, coming from a distance, fall on these particles, a vibration is set up in them, they touch each other, and a charge of electricity applied to the tube is allowed to pass through and can be registered in the usual way.

Thus, the coherer, being supplied with an ordinary battery and Morse electro-magnet, permits the circuit to be closed when the electric waves from the mainland reach it. The click is registered only when the rays or waves from the Herz generator are reflected on it.

The electric waves are not believed to be vibrations in the air itself, but rather in the ether between the par-

ticles of air. As compared to light waves, they are of enormous relative size. It will be noted that the electric current on the island sent through the coherer has no other office than to strengthen and register the effects of these waves or rays caught by the concave mirror and focused upon the coherer.

That the electric waves do in many ways act like light rays, though they are much longer, I saw recently demonstrated in a lecture I was permitted to attend at the Polytechnicum in Charlottenburg-Berlin. To get some idea of the relative size of electric waves when compared with those of light, imagine that the light waves are represented by the width of the Hudson River at New York city; then the electric waves would be represented by the Atlantic Ocean and Baltic Sea, say from New York to St. Petersburg.

Or, to express it in sound waves, the waves of light are so high and sharp, while those of electricity are so long and deep, that the light waves may be compared to the highest, shrillest sound which the human ear can grasp, while those of electricity are comparable to the deepest diapason note of an organ.

The lecture I allude to was one which Professor Rubens, a young German of Dutch descent, now employed as instructor at the Polytechnic, gave to a number of teachers. Since Herz's death in 1888, he said, much progress has been made in reducing the size of the electric-wave generator. As the size of the apparatus has a relation to the length of the electric waves, and as it was desirable to shorten these waves, the decreased size of the apparatus has been of use in making air telegraphy more practicable. Shorter electric waves are more approximate in their action to waves of light, and go further. Up to the present the shortest are those of the Russian experimenter, Lebedew, who has produced them from six to seven millimetres long.

Professor Rubens showed a thermo element, or heat catcher, invented by himself to take the place of Marconi's coherer, which catches, like the coherer, the refracted and focused electric rays. The spark, he observed, was not at all a necessary phenomenon in electricity. He then made many curious experiments to show the similarity in action of waves of light and waves of electricity, and also drew attention to the very different way in which electric and light waves pass through different substances. Thus he reflected electric waves like light, refracted them with prisms and diffracted them with a wire grating of parallel wires, as light is diffracted by Langley's grating. He then showed the polarization of these rays—freely, through the fibers of wood longitudinally; and badly, across the fiber; easily, through closed books with the leaves; and with difficulty, across. Thus, a pile of books or sheets of glass showed polarization like crystals under light. He showed, also, that, on account of the length of these waves, their energy was absorbed differently by different substances; thus, (1) water absorbs all the energy, (2) metals absorb all the energy, (3) glass absorbs nearly all, (4) paraffine absorbs hardly any, and (5) hard rubber absorbs hardly any. Thus they move through hard, black rubber and paraffine as light moves through air, glass or water—that is to say, with hardly any resistance—while glass lets very little of them through, and metal and water are impervious to them.

Professor Rubens imbeds his Herz generator in petroleum for better isolation, and as a handy concentrator of the electric waves or lens, uses a round glass bottle filled with petroleum. By placing in turn the glass prism, wire grating, block of wood, pile of books, water, paraffine and hard rubber in the line of the unseen electric waves pouring from the generator and concentrator toward the wave catcher, he showed on an indicator the passage, easy or retarded, of the unseen flow or its entire interruption.

Of course, it is difficult by verbal description to make experiments of this kind clear, but I trust that this summary description may be of use to experimenters or stimulate inventors to solve in a simpler and more effective way the problem of telegraphy through the air.

Berlin, June 24.

Electric Power for British Columbia Mines.

To reduce the operating expenses of the mines in the neighborhood, 50 per cent is the object sought, and which, it is said, will be attained by the Kootenay Power and Light Company, whose plant, when in active operation, will represent an outlay of considerably over a quarter of a million. Sir Charles Ross, who was recently in Victoria, is the prime mover and organizer of this undertaking, which, on economic grounds, is sure to solve the hitherto insurmountable difficulty of the treatment of the low-grade Rossland ores on a paying basis. Should the expected saving be effected, it will cause a great boom in mining properties within the company's "sphere of influence." Bennington Falls, on the Kootenay River, about 12 miles from the city of Nelson, has been chosen as the site, and the water-power available being practically unlimited, the plant can be increased from time to time as required.

Water is taken from the river at a short distance above the falls, and, by means of a canal 25 feet wide, is conducted to the point where two pairs of turbine wheels are situated. With a head of 34 feet, these wheels are expected to develop energy equivalent to 3,000 horse-power, which will drive the dynamos at a sufficient speed to enable the company to supply all the electricity for mechanical purposes for which there is likely to be a demand in that neighborhood for many years.

Heavy copper wire will be used in the transmission of the electric current to the various mines and towns using it, the intention being to supply all points within a radius of 30 miles. The plant which is being installed is the exact counterpart of one for a similar purpose now being operated at Fresno, Cal., where 35 miles is the present limit of transmission.

The site for the machinery, as well as the waterways, are all ready for the installation, and as the turbines and dynamos are now on their way westward, it is expected that the company will be in a position to supply power by November 1. The electrical portion of the plant has been supplied by the Canadian General Electric Company. The completion of this undertaking will mark a new era in the manufacturing industries of British Columbia, as well as in the mines in and about Rossland, Nelson, Kaslo, Slocan City and Sandon, to each of which towns will be delivered the power generated at the falls.

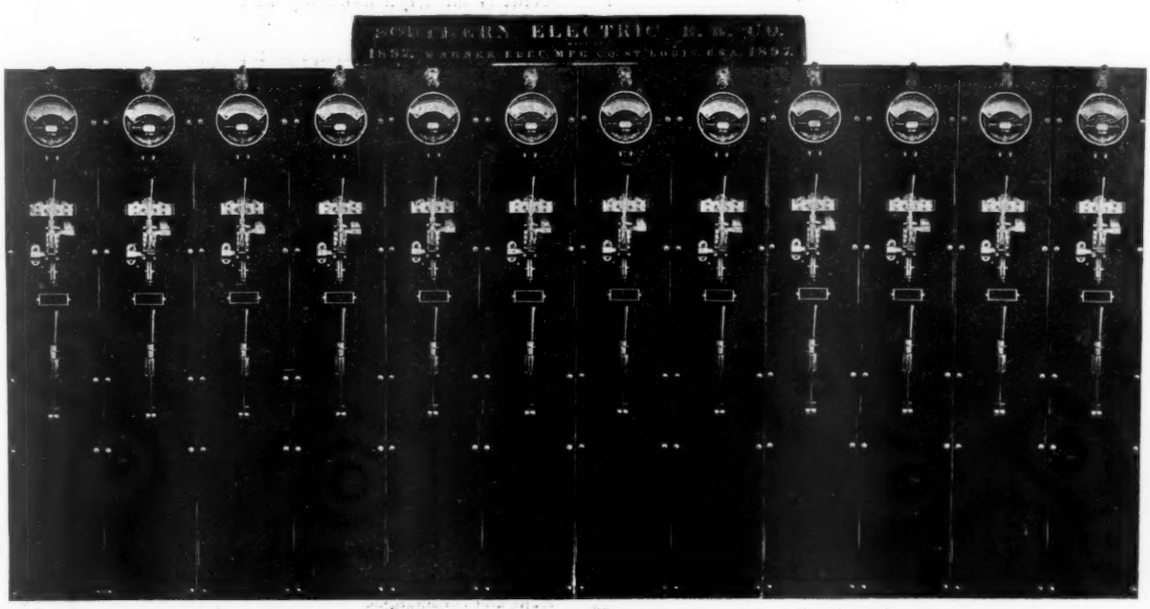

FIG. 3.—WAGNER FEEDER SWITCHBOARD IN THE STATION OF THE SOUTHERN ELECTRIC RAILROAD COMPANY, ST. LOUIS.

Advertising by Phonograph.

An entirely novel method of presenting one's product to the consumer was to be seen and heard at the recent Street Railway Convention at Niagara Falls. Mr. Fred J. Cross, manager of the Buffalo Engine Works, was the genial gentleman in charge, and he invited all to listen to a very distinctly speaking phonograph, and this is what the listener heard through the ear tubes, and every one listened to the end, and then complimented Mr. Cross on the original idea and the clear enunciation of the instrument:

GENTLEMEN OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION: We, the Buffalo Engine Works, have in connection with our large manufacturing establishment a repair department, equipped with every facility for the complete rejuvenating of any old, worn or burned out parts of any electrical apparatus, such as commutators, armatures, fields or transformers, and having in view, the fact that it is much more difficult to repair than to put up new work, have employed none but the most skilled workmen in every branch of this department. The material we use is the very best the market affords. Our commutator segments are the celebrated drop-finger style, samples of which you will observe on the table before you. We have prepared a small catalogue and price list of repairs to electrical apparatus in general, and have listed all the well known makers of commutators, armatures, etc., and have spared neither time nor trouble in going over the list to make it as complete as possible and we believe that you will find our prices as reasonable as can be expected with strictly high-grade work. Take one with you and file it for future reference. Give us a trial, and we trust we will merit your continued patronage. All our work is guaranteed.

Thanking you in advance for any favors you may confer on us, and extending to you all a most hearty invitation to visit us in our works at 12 to 20 Perry street, Buffalo, N. Y., where we will be pleased to show you through all the various branches of our large establishment, we are yours Very truly,

BUFFALO ENGINE WORKS.

Electrical Review

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ASSOCIATE EDITOR:
STEPHEN L. COLES.

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Special Notice to Advertisers.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication on the following week.*

NEW YORK, SEPT. 29, 1897.

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Lord Kelvin seems to be thoroughly enjoying his American trip. A glance at his itinerary since his arrival on our shores shows that, for a man of his years, he has covered a great deal of distance in a very little time.

Mr. H. H. Vreeland's paper on the municipal ownership of street railways, published in this issue of the ELECTRICAL REVIEW, is the incisive and convincing argument of a practical man against the impractical theories of badly informed enthusiasts.

MUNICIPAL OWNERSHIP OF GAS-WORKS IN PHILADELPHIA.

Since 1841 the city of Philadelphia has owned and operated its own gas plant. The plant was installed in the city by a private company in 1835, the municipality reserving the right to buy out the stockholders on stated terms. After more than 50 years' experience with municipal ownership, the Philadelphia city authorities are now desirous of disposing of its gasworks to a private corporation under a lease, and the United Gas Improvement Company of Philadelphia is endeavoring to secure such lease. A legal opinion has been rendered that the city has sufficient authority to lease its gasworks if authorized by an ordinance, and last week a hearing on the question was held, in which the practical results of municipal ownership were laid bare.

The number of gas lamps in the city is 17,500, distributed over an area of 129 square miles. During 1896 the receipts from all sources of the bureau of gas were $3,318,145 and the expenditures were $3,552,103, showing a deficit of $234,958. In reaching these figures, no allowance is made for interest upon the investment or for the deterioration of the plant. Nevertheless the official figures of the bureau of gas show an apparent profit of $352,988. This, however, is done by including the profit on $700,000 worth of gas purchased from the Philadelphia Gas Improvement Company, at 37 cents per thousand, and sold to the public at $1 per thousand feet. The fact remains that upon the gas manufactured by the city the loss is constant and considerable.

The price of gas in Philadelphia is no cheaper than in many other American cities where it is supplied by private corporations. Travelers, and even candid citizens of Philadelphia, admit that the quality of the gas is inferior. Col. A. K. McClure, a prominent Philadelphian, was one of the speakers at the public hearing on the matter last week. We quote below some of his remarks:

"We have very bad gas in Philadelphia. I doubt whether any other city in the Union has as bad gas as we have. You have lost thousands and thousands, and scores of thousands, yea, hundreds of thousands of dollars, in this city, because your gas is unfit for use. This is a fact that none will dispute. Men have given all manner of theory, but we must look at the facts, and, unless Philadelphia shall produce a better quality of gas, in five years from this time probably as much as 25, 30, or even 40 per cent of the gas will be supplanted by electric lights. Our gasworks do not pay. They are to-day a positive loss to the taxpayers of this city. They show in a year a loss of nearly a quarter of a million dollars."

The Philadelphia gas plant is said to be out-of-date, imperfect, and insufficient for the requirements of the city's needs. Naturally the management of the works, instead of being in the hands of experienced men, actuated by a desire to operate them for profit and urged on by competition to furnish good gas at a low price, is under the direction of politicians without special knowledge of the subject and undisturbed by the incentives mentioned. Practically no improvements in the plant have been made for the reason that there is no available fund for such purpose. Last year but $55,000 was set aside for permanent improvements in the plant, an amount so small in practical significance as to be quite useless.

Many of the most prominent citizens in Philadelphia are urging the municipal authorities to go back to first principles by leasing the plant to a private corporation. In theory, advocates of municipal ownership would urge that there is no good reason why the city can not conduct a gas plant as economically and efficiently as a private corporation. The theory may be good, but the practical experience of fifty years shows that there is a good reason why the thing can not be done. This reason is that it is an impossibility to keep politics out of a gas bureau so long as it is operated as a department of the city government. The result of this is, as shown by the public hearing last week, that there is a substantial increase in the cost and a decrease in efficiency in the operation and management of the plant. We think it is quite apparent that municipal ownership of gasworks in Philadelphia is a failure, and a costly one at that.

We respectfully suggest to Mr. Eugene F. Phillips, of Providence, R. I., that some time in July, 1898, he forward an invitation to his annual clambake to the editor of London *Lightning*. The latter gentleman recently quoted from the ELECTRICAL REVIEW an account of the 1897 clambake, and endeavored to have some fun at the expense of the viands and fluids served on that occasion. He seems especially amused over the fact that "sarsaparilla" was among the liquids. He seems to think that the famous patent medicine of that name, as known in England, was served as a cordial after the clambake. We can excuse this ignorance, because we are told by a man who has been there that there is no beverage known as "sarsaparilla" in England. Just as a foretaste of what we may expect, we believe that Mr. Phillips would be willing to send to the editor of London *Lightning* a quart bottle of "sarsaparilla," such as was served at the last clambake. Furthermore, we think the editor would like it, and we know Mr. Phillips to be of that altruistic character which will permit him to go even to the extreme of buying "sarsaparilla" for English editors. With a bottle of this beverage in one hand and one of the wooden cigars Mr. Magden, of *Lightning*, acquired at Niagara Falls in the other hand, our esteemed confrère would be in an ideal attitude to write funny things about American institutions.

LORD KELVIN AT SCHENECTADY.

WITH LADY KELVIN THE DISTINGUISHED SCIENTIST INSPECTS THE GREAT WORKS OF THE GENERAL ELECTRIC COMPANY.

The 4,000 employés of the most extensive electrical factories in the world were on the *qui vive* Friday of last week over the expected visit of Lord Kelvin. And when, shortly before the noon hour, the man whom every electrical worker respects and loves came among them, his eyes were not alone privileged to see the most modern of electrical workmanship, but received a pleasing view of as intelligent and clean-appearing a body of workmen as he could find in any great mechanical establishment in the world. It was impossible not to be impressed by the scene, and to note the interest taken by the artisans everywhere on the appearance and acts of Lord Kelvin, the undisputed leader in the world of applied and theoretical electrical science.

The distinguished party was shown through rapidly and systematically. Prof. Elihu Thomson, who had especially come from Lynn, Mass., and Messrs. E. W. Rice and C. P. Steinmetz were the immediate conductors for Lord Kelvin, though every department manager and Chief Engineer Potter were constantly consulted. Lord Kelvin's note-book was in constant use, and his interest was strikingly intense and unabated to the last. A carriage had been provided, and was used wherever possible in conveying Lord and Lady Kelvin to the buildings (there are some 60 in the entire plant, covering about 50 acres) where the latest developments were to be seen. The whole arrangement of the visit and inspection by the aged but hale scientist was admirably planned. Nearly all the officials of the General Electric Company, including Capt. Eugene Griffin, Mr. S. Dana Greene, Mr. J. P. Ord, Mr. John Kreusi and Mr. W. J. Clark, were present. The rain interfered somewhat with the pleasantness of the visit. A group photograph, with Lord and Lady Kelvin in the center, is shown on this page. It was taken in front of one of the buildings during a lull in the rainfall.

After a delightful luncheon at the residence of Mr. S. Dana Greene, Lord Kelvin and party departed for Boston in the private car of Mr. Spencer Trask. An enjoyable luncheon was served to other visitors at the Mohawk Club, with Messrs. Conover and Clark as genial hosts.

In the afternoon a number of highly successful tests of the new Sprague electric elevated railway system was witnessed by General Manager Merrill, of the Erie Railroad; Dr. Louis Duncan, of Baltimore, and several others. Lieut. Frank J. Sprague was present in person and had every reason to be elated over his successful exhibition.

THE TRIP THROUGH THE WORKS.

Lord Kelvin was accompanied by Lady Kelvin, Count di Brazza-Savorgnan, Messrs. Spencer Trask, Alanson Trask, R. R. Bowker and Geo. Foster Peabody. In addition to the officials of the company there were present W. F. Merrill, vice-president and general manager of the Erie Railroad; Dr. Louis Duncan, Dr. Cary T. Hutchinson, Frank J. Sprague, T. C. Martin, Chas. W. Price, H. G. Prout, C. T. Childs, J. J. Swann and others.

Building No. 9 was first visited, and was crowded with dynamo parts in all stages of completion. All the machinery in the shop is operated by electric motors, and many are so arranged that the work may be kept stationary while the cutting mechanism is moved from point to point, as the operations require. This building contains some very large planers, and the largest boring mill ever built.

From this building the party passed into the testing-room, where every machine is subjected to rigid test before shipment. Connected to this building, and forming part of it, is the machine shop and shipping department, a total length of 1,320 feet, all under one roof, with electric traveling cranes running from end to end, carrying the unfinished parts to their respective assembling points, and the finished machines finally to the shipping department end. In planning this building everything has been disposed for handling the machinery with the utmost rapidity and precision. Ranged down both sides of the central aisle stood machines of all sorts and sizes, from that with a capacity of some 15 or 20 16-candle-power lamps to those built to supply current to the enormous number of 30,000 lamps. One of these latter machines had just been shipped to Brooklyn, the parts making five complete car loads. Seven 1,500-horse-power railway generators were in process of completion for the Fourth and Sixth avenue lines of the Metropolitan Traction Company, and two 2,000-horse-power each for Boston. Under test were two 1,000-horse-power three phasers for the Lachine Rapids plant; five of 800 horse-power each for the great works at St. Anthony's Falls, Minn., together with the 1,250-horse-power, 20,000-volt transformers for use at Niagara Falls and Buffalo, and five 700-horse-power rotary converters also for St. Anthony's Falls. Lifting its respectable height to the roof was one of the 1,200-horse-power smooth-body armature machines for the Edison Electric Illuminating Company, of New York, almost ready for shipment.

From this building the party passed into the power-house, in which Lord Kelvin was shown an interesting collection of dynamos, including many of the older types of machines as well as some of the most recent, all in operation, furnishing power to each department through a system of underground conductors. The next building visited was No. 15, in which the great part of the armature winding and the manufacture of armature coils is carried on. Here Lord Kelvin was shown examples of the recently developed General Electric revolving field alternators, dynamos with revolving fields and stationary armatures—a method of construction adopted to allow of more perfect insulation for high voltages, while eliminating collector rings and moving contacts. In long-distance transmission work, such dynamos as these can be wound for the high voltages necessary for the transmission lines and step-up transformers be dispensed with. Wound for a pressure up to 15,000 volts, they are subjected to very high voltage tests, the 1,000-kilowatt, three-phase alternator for the Brooklyn Edison Company being tested, in the presence of Lord Kelvin, under a pressure which fell little short of 50,000 volts. He was too late to see the 2,000-kilowatt machine for the same company, which left the works on the day previous. The diameter of this machine is 25 feet. It weighs 163,000 pounds, and is, perhaps, the largest dynamo ever built, in point of size. Its speed is 75 revolutions, the field being keyed directly to the engine shaft.

LORD KELVIN AT SCHENECTADY.—GROUP SHOWING LORD AND LADY KELVIN, PROF. ELIHU THOMSON, C. P. STEINMETZ, E. W. RICE, SPENCER TRASK AND FATHER, CAPT. EUGENE GRIFFIN, S. DANA GREENE, J. P. ORD, GEORGE FOSTER PEABODY AND OTHERS.

An interesting experiment in high-voltage currents was then made by Mr. C. P. Steinmetz. An arc was sprung between two metallic points, some 15 inches apart, with the current at a pressure of 180,000 to 200,000 volts, and drawn out to a length of about five feet, until it could no longer hold.

Passing from building 15 into building 12, Lord Kelvin was shown the principle of Professor Thomson's magnetic blow-out. A current of 1,000 amperes at 500 volts was passed through an automatic circuit-breaker, and the extinction of the arc instantaneously fully demonstrated. To show the effect of the magnetic blow-out on a blown fuse, the magnetic fuse box was brought into requisition and the same test applied. The blown fuse withdrawn showed the very small amount of metal melted as the arc was created and extinguished. The railway motor-testing department was next visited, and the method of testing railway motors under very severe conditions explained.

The party then proceeded to the rear of building 23, where the new surface contact system of the General Electric Company was shown in actual operation with all the working details visible. The advantages of such a system for city streets were quickly appreciated. The overhead trolley wire is superseded by a series of small cast-iron disks set in the pavement in parallel rows between the rails of the track, each disk convexed to about one inch above the surface, at distances of about four feet. The disk near to one rail is the positive disk, that near the other the negative disk. In this system only those disks immediately under the car are alive; all the others are without current. The current is brought to the positive disks by an automatic magnetic switch, which is set with a number of others in a manhole, instead of being buried in the street near to its own disk. The car is provided with a small storage battery and with two long shoes suspended beneath it, touching always one or two disks. To start the car, current from the battery is let into the shoe. This energizes through the disk the coil in the automatic switch, and establishes connection between the feeder circuit and the motors. All leakage is taken care of by placing the negative disks in a cast-iron box, which acts as a shield and effectually takes care of any wandering current. Sparking in the automatic switches is prevented by providing them with magnetic blow-outs. After witnessing the operation of this system, the party mounted the searchlight tower, whence a splendid bird's-eye view of the entire works was had.

The electric brake for electric cars, then shown to Lord Kelvin on car No. 9 of the Schenectady Street Railway, practically gives the motorman an automatic and instantaneous check on the motion of the car, the brake being applied by the same single movement of the handle of his controller, which cuts out the current from the motors.

The brake consists of two steel disks, one of which contains a coil of wire; the other is a plain metal disk. The moment the car is stopped, and no current is flowing from the controller, the motors become very powerful dynamos, which turn their current into the coil of that one of the disks which is attached to the motor. It then becomes a very powerful electro-magnet with a strong power of attraction. The other disk is revolving on its axle, but the moment the first disk becomes an electro-magnet its attraction is so powerful to the surface of the latter that it is brought to a standstill, and with it the car. Should the wheels skid, as on an incline, the armatures of the motors naturally stop; the disks separate, the wheels begin to revolve again, and the moment they do so, current is generated in the motors, and the disk, with the coil, becomes an electro-magnet, and the car stops again. In other words, the brake is always in operation once it is applied.

Asked to express an opinion on his visit, Lord Kelvin said: "I am enjoying myself very much and learning enormously. There are no shops in the world like these; they are among the great wonders of America."

OBITUARY.

Charles A. White, president of the Bibber-White Company, Boston, died at his home in Malden, Mass., on September 16. He was well known in the electrical trade, especially in New England. Last January he was elected president of the Malden Common Council.

DISPATCH TO SAVE LIFE NOT DELIVERED.

AN INTERESTING AND UNUSUAL DAMAGE SUIT.

How far a telegraph company can be held liable in money damages for delay in the transmission of a message warning a man that his enemies are about to kill him is exhaustively discussed by the United States Circuit Court of Appeals in a decision just handed down.

This decision, which is written by Judge Newman and concurred in by Judges Pardee and McCormick, is made in a suit brought by one Mrs. Ross to recover damages from the Western Union Telegraph Company for causing the death of her husband, Robert C. Ross, by delay in delivering a message which warned him that his life was in danger. From the facts presented to the court, says the New York *Evening Sun*, it seems that Ross was shot to death by four brothers named Skelton, between whose family and his own there existed a feud of long standing.

Ross had incurred the enmity of the four brothers Skelton, and to avoid them left Scottsboro, Ala., early on the morning of February 4, 1894, to go to Stevenson, in the same State. Before leaving home he requested E H. Ross, a relative, to inform him by telegraph of "anything important for him to know." Between 10.17 and 10.20 o'clock that morning, E. H. Ross went to the telegraph office at Scottsboro and sent the following message, paying 25 cents for the transmission of the same:

"To R. C. Ross, Stevenson, Ala.: Four men on horseback with guns following. Look out.
(Signed.) "E. H. Ross."

While E H. Ross was writing this telegram, or just after he had written it, Judge John B. Tally came into the office and wrote a telegram. The message sent by Tally was as follows:

"To William Huddleston, Stevenson, Ala.: Don't let party warned get away. Say nothing.
(Signed.) "John B. Tally."

The evidence before the court was to the effect that when Tally handed his message to the operator he said: "Here is one that bears on that one," meaning the one sent by E. H. Ross.

The Court says that the two messages appear to have been sent at the same time, or as near the same time as they could be transmitted. When Huddleston, the operator at Stevenson, received the message, he wired back to know what the message to him (Huddleston) meant. It appears that Huddleston was Mayor of Stevenson as well as telegraph operator. He appears to have been under the impression that he was to have Ross arrested, and he took steps to that end by sending for the Town Marshal. While Mayor Huddleston was talking with the Marshal, Robert C. Ross stepped out of a carriage in front of the railway station. He had scarcely placed his feet on the ground when the four Skeltons, who had been pursuing him on horseback, and had left their horses about a half mile behind, opened fire on him from different directions with guns and pistols and killed him.

Soon after her husband's death Mrs. Ross, as administratrix of his estate, sued the Western Union Telegraph Company. She asserted that if the agents of the company had used greater diligence in delivering the telegram from E. H. Ross to Robert C. Ross, he would have had time to escape, and his death would have been averted.

The case was tried twice in the Circuit Court. On the first trial the Court submitted the matter to the jury, which returned a verdict in favor of the plaintiff, and this verdict the Court subsequently set aside. On the second trial the Court gave the jury peremptory instructions to return a verdict for the defendant. From this ruling the appeal—just decided—was taken to the United States Circuit Court of Appeals in the Fifth Circuit.

In discussing at length the question of the telegraph company's liability for Ross's death, the Court says: "Assuming that there was negligence on the part of the company in the matter of non-delivery of the message, was that the cause of the death of Ross in such a way as to give his legal representative a cause of action? If another and independent force intervened to bring about the death of Ross, it will be the responsible cause, even conceding the failure of the telegraph company to deliver him the message from E. H. Ross in time for it to serve as a warning. The new and independent force would be, in law, the proximate cause; and, if the company's neglect could be said to be a cause at all, it would be remote and ineffective. This is not the case of one cause setting another cause in motion, and thereby the original cause, by an unbroken sequence, producing a result; but it is the situation recognized in all the authorities, where an entirely new and independent cause intervenes to bring about a result. Continuing to assume the strongest case against the company, what it did would not itself have killed Ross, nor would anything it set in motion."

As to the Skelton brothers' long chase after Ross the Court has this to say: "The company did not start the Skeltons in pursuit of Ross. The Skeltons, for reasons of their own, were acting on entirely independent lines, without any kind of connection with the telegraph company. Much authority might be cited on this line, but so unusual are the facts of this case that it must be controlled by recognized principles rather than by any direct authority on anything like similar facts."

The alleged delay of Huddleston, acting in his dual capacity of Mayor of Stevenson and as the telegraph operator at that town, is thus considered and disposed of by the court in this language: "But if Ross had received the telegram would it have prevented his death? It appears from all the facts in the case that the Skelton brothers were close on his track, and, even if Huddleston had exercised the most extraordinary diligence, and had gone to meet him with the telegram, it is barely possible, but hardly probable, that Ross would have escaped his pursuers. We have discussed these questions in deference to counsel, who earnestly pressed them orally and by brief, but it is not necessary to rest our decision thereon, for, under the disputed facts in the case, the telegraph company was not guilty of negligence in not delivering the message of warning in question. Robert C. Ross, the person to whom the message was addressed, was not a resident of the town of Stevenson, nor was he, in fact, in the town of Stevenson at the time the message was received at the Stevenson office. As the message was directed to no particular street or locality within the delivery limits of the town, it was the duty of the telegraph company to deliver a written copy to Ross promptly on his calling at the telegraph office, and, failing Ross's early call at the office, to deliver such written copy to him by messenger within a reasonable time after the agents of the company should be informed that Ross was to be found at some locality in the town of Stevenson. Ross arrived in the town of Stevenson soon after the message reached the Stevenson office, and was evidently proceeding directly to that office when he was waylaid, shot and killed without there intervening sufficient time in which the telegraph company could have delivered a copy of the message to him, even if the company was charged with notice of his arrival in town as soon as he came in sight of the telegraph office. Conceding that the message sufficiently notified the company of the importance of speedy delivery, still the company was not charged with the duty of sending out messengers with copies of the message to watch for the arrival of Ross; and, unless charged with such duty, it is clear it was guilty of no negligence."

In conclusion, the court sustains the action of the trial judge in directing the second jury to return a verdict in favor of the telegraph company.

The Municipal Electric Lighting Plant in Manchester, Eng.

Some two years ago we gave some particulars of a commercial incandescent lighting plant owned and operated by a municipality (Electrical Review, p. 244, May 8, 1895) on the other side of the water, as an example of what might possibly be effected in the direction of municipal ownership and control, under conditions different from those obtaining in the United States. We are now in a position to furnish our readers with further data as to the progress of the enterprise. On the starting of the plant in December, 1893, there were 289 consumers, while in May last there were 1,624, with applications coming in faster than they could be attended to. Further extensions of the plant being thus necessitated, it is proposed to borrow on the credit of the city a further sum of $650,000, making a total amount raised on loan of $2,400,000, of which, however, up to March last, only a little over a million and a half had been actually expended. The initial capacity of the plant was about 20,000 lamps of 16 candle-power, the present capacity being nearly 75,000 lamps, while the extensions will greatly increase the area supplied (some 20 square miles), and also, owing to the expansion of the power service, add considerably to the day load.

No difficulty is experienced in raising money on the securities offered by the city, as its consolidated stock (four per cent), sells in the market at a good premium; for example, the quotation we have before us is 153½ for stock whose par value is 100, and was originally issued, if we remember rightly, at about 110. The present loan will be issued on a 25-year basis, but no difficulty will be found in obtaining funds.

With regard to the prices charged for current, some interesting features present themselves. The chairman of the committee recently stated that a reduction in the price was contemplated, the present charges being 12 cents per kilowatt hour and three cents per kilowatt hour, with a fixed charge of 75 cents per lamp installed, a consumer using the current long hours taking the latter charge, while for power purposes the charge of three cents per unit is applied for a service of 48 hours per week, without any fixed charge. At present a meter rent of about $3.50 per annum is made, but it is anticipated that that charge will shortly be abandoned.

It is somewhat remarkable that such a large and rapidly increasing demand for electric current should be found in face of the fact that the city also furnishes a very good gas at about 55 cents per 1,000 cubic feet; and it is also surprising to us to find that, it is estimated, at four cents per kilowatt hour, the cost of public lighting will be less by electricity than by gas. Hitherto nothing but commercial light and power have been furnished, the streets being still lighted by gas. It is proposed, however, now to carry out a certain amount of street illumination by the electric current.

The system used is entirely an underground one, with the Hopkinson five-wire and three-wire mains.

In our previous article we suggested some reasons for the low figures at which current was furnished, such as low price of coal and labor, high load-factor, economical and honest management, etc., to which we would refer our readers.

Notwithstanding these prices, the net profit for the financial year ending in March was $84,000.

One of the satisfactory results of the operation of this plant is that, after carrying over $50,000 to renewal and reserve funds, the committee in charge propose this year to hand over to the city $50,000 in reduction of the city taxes.

In considering the relative merits of municipal and of private enterprise in the matter of electric lighting and power plants, it is too frequently the case that comparisons of the cost of the two systems are made (both on one side of the question and the other) on insufficient data. The length of circuits, hours of burning, candle power of lamps, cost of fuel, allowances for depreciation, value or rent of real estate, dilution of stock, management charges and other matters should all be reduced to the same terms before a fair comparison can be instituted. If this is the case with our own comparatively familiar conditions, still less can any hard and fast conclusions be deduced from the incomplete figures given above. We offer them as material towards the solution of a difficult and important problem.

THE MUNICIPAL OWNERSHIP AND OPERATION OF STREET RAILWAYS. *

BY H. H. VREELAND.

Whatever the cause, the fact remains that the advocates of municipal ownership and operation have had the field virtually to themselves for several years, and during that time have succeeded in circulating a number of falsehoods, which, unanswered, the people at large are justified in accepting as true. It is fair to suppose that during the years in which they have held undisputed control of public attention, the advocates of the doctrine have fully stated their case, and so it seems to me that at this time we are advantageously placed to view the whole of the claims made by them. When originally broached, *municipal ownership* was coupled with the idea of *municipal operation*. but this claim has been formally and publicly abandoned by the most advanced spirit in the so-called reform.

It is not to be expected that an advocate of municipal ownership and operation will be influenced by the statements of a railroad president on the subject. I take it, however, that both those who have a "professional" and those who have only a sentimental interest in this debate will accept as final the statements of such men as Dr. Albert G. Shaw, one of the professors of the Johns Hopkins University, and author of "Municipal Government in Great Britain" and "Municipal Government in Continental Europe;" Louis Windmueller, president of the Reform Club; Mr. J. Harsen Rhoades; Mr. Allen Ripley Foote, author of "The Law of Incorporated Companies Operated Under Municipal Franchises;" Mr. Frederick W. Wurster, Mayor of Brooklyn; Mr. Charles A. Schieren, ex-Mayor of the same city; Mr. John Joralemon, president of the Board of Aldermen of New York city, and a number of other equally distinguished.

If further authority than this is needed, it will be found in the quotation herein from a report made to the Legislature of New York by a special committee appointed for the purpose of investigating that subject of the alleged public demand for municipal ownership and control. This report is contained in two bulky volumes, accompanied by the testimony taken by the committee and published by the State as a public document in 1896. That committee not only failed to find that the demand for municipal ownership was supported by public sentiment, but reported directly against it in unequivocal language.

So far as the city of New York is concerned, all that is left of the original claim in favor of municipal ownership has been conceded in the normal development of the law, for that municipality now owns such franchises as have not already been given or sold to the highest bidder at public auction. To-day, with us, no franchises can be legally given away; regulations are prescribed by statute under which they are sold, in open market, after long notice, to any one who offers the highest price for them. This highest price, by the way, is so fixed that it varies with the growth of the gross receipts earned from the franchise granted.

There remains, then, concerning the roads now in operation, the single question of municipalities purchasing back those franchises which they have already given and sold. Franchises that were given away in the early history of street railways in New York city were of little value at the time of granting, and the history of their development and the difficulties experienced in obtaining money to build and operate them would be interesting reading to those who insist on discussing them from the point of present value. The stock of some of the horse car lines in New York city was given away in payment for hay, oats and bedding at 25 per cent of its face value, and was only accepted at that rate for the reason that there was nothing else with which to pay. The heated advocates of municipal ownership and operation are ignorant of facts like these, and insist on discussing the original grant from the point of present value—a value largely imparted to them by the enterprise and good management of their owners. It is unfortunate, too, that the case of railroad franchises has been complicated in this discussion with that of other quasi-public grants, because the merits of our position are distinct. The benefits which street railway developments have contributed to cities in a variety of ways is beyond calculation. Through its agency the death rate has been reduced by relieving the congestion of population in certain crowded areas, and it has increased the taxable value of real estate enormously.

If, in the face of the deliberate utterances and warnings of those who have officially investigated the merits of the question, it should still be determined that the municipalities of the State should own and operate the street railway franchises, the two unanimous claims of the advocates of the doctrine, so far as New York city is concerned, will come up for discussion and consideration in this form:

How is the city to take possession of the property and rights now owned by private corporations?

What improvement can the city make to relieve the public from the "wrongs" which demagogues have invented?

An intelligent answer to the first question requires that reference should be made to the character of the property of a street railway coporation.

The property of such a corporation consists of its real estate, which includes land, buildings and track; its personal property, consisting of cars, horses and all movable chattels, and its franchise to construct, maintain and operate its road.

It is quite apparent that the franchise is the element which gives value to the corporate property. It is that upon which the earning power of the corporation depends, and it is that which gives value to the corporate stock.

The character and nature of a franchise as property has frequently been the subject of consideration by the courts.

It has been uniformly decided to be a contract and entitled to protection against legislation which would destroy it, or which, by some alteration of the charter, would impair its obligations. Corporations are entitled to have the clause of the Federal Constitution liberally construed, so as to secure their franchises every immunity in such respects.

Assuming that ownership of street railways would be decided by the courts to be a municipal power, under the Constitution the power of eminent domain can be delegated by the legislature to municipalities, and it could be, through its exercise, in the absence of agreement with the corporation, that railroad property and franchises now in existence could be acquired by the cities of the State.

Municipal ownership of street railways has never been the policy of this State, and before there can be such ownership the municipalities must be empowered, by appropriate legislation, to acquire and hold such property. When such enabling statutes are passed and the power of eminent domain delegated to the cities, street railroad property now in existence may be either purchased by agreement with the corporation owning and operating it, or may be taken after the value is ascertained by the method I have pointed out. In ascertaining and fixing that value, the most important element will be the value of the franchise to maintain and operate the road, and in fixing that, due regard must be had and due effect given to the future growth of the locality in which the roads are operated, and the life or term of existence of the corporation owning them, and the reasonable and just expectation which those who have invested money in such property or its securities had in mind when so investing.

It is quite plain, therefore, that to acquire many of the existing roads in the State would impose upon the cities taking them a large burden of debt and taxation, which, in some instances, it is not improbable would be entirely beyond the limit of indebtedness which the Constitution imposes upon the municipal corporations of the State.

The extent and nature of the benefits which the centralizing of the Metropolitan Street Railway system has achieved, is best snown by the statistics. The following table shows the expansion of its transfer system for the last 10 years:

Year.*	Miles of Track.	Paying Passengers Total Number.	Transfer Passengers. Total Number.	Transfer Passengers. Prop. to paying.	Average Fare. (Cents.)
1896-97...	190	177,338,677	56,929,611	32%	3.78
1895-96...	172	143,965,151	28,450,996	19	4.18
189 -95...	140	109,686,472	9,671,647	9	4.59
1893-94...	131	107,086,534	5,306,654	5	4.76
1892-93..	80	63,011,785	3,203,842	5	4.76
1891-92...	61	45,239,670	2,645,800	6	4.72
1890-91...	37	39,971 9/9	2,7c6,080	7	4.68
1889-90 ..	36	39,571,464	2,523,239	6	4.70
1888-89...	36	37,386,509	2,206,866	6	4.72
1887-88...	36	37,318,730	1,991,871	5	4.75

*Years ending June 30, except 1887-88 and 1888-89, which ended September 30.

From this table it will be noticed that in the first seven years about one passenger out of 15 or 20 received a transfer; in the year 1894-95, one out of every 11 passengers received a transfer; in 1895-96, one out of every five, and in 1896-97, about one out of every three.

The phenomenal development by the company of this great privilege speaks for itself. By means of it the general fare during the whole day has been reduced to 3.78 cents, and during the crowded, rush hours of morning and evening, when the working people are going to and coming from their work, the average rate of fare is only two and one-half cents. This transfer system, like the lighting of cars and various other improvements, was done without legislative compulsion and in accordance with the settled policy of the company to increase public safety and cheapen transit.

While voluntarily developing this transfer system, the company has also made large contributions annually to the funds of the city and State. A resolution was recently passed by the Board of Aldermen of New York city, demanding that the comptroller furnish the board with a statement of the amount of taxes paid by the various street railroads in the city of New York, and the comptroller furnished it with the following table, showing the amounts paid during the year 1896 by the Metropolitan Street Railway Company and the Metropolitan Traction Company.

CITY TAXES.

Percentage of receipts...	$43,101 93
Fixed rental.....	150,000 00
Car licenses.....	40,280 00
Personal tax.....	39,114 27
Tax on real estate.....	112,607 30
Track taxes.....	54,489 75

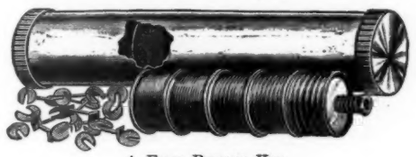
STATE TAXES.

Percentage of earnings..	$90,000 00
On capital stock of street railway company.....	20,000 00
On capital stock of traction company.....	42,000 00
Total.....	$591,593 25

In this statement no account was taken of the contributions of the company, amounting to over $100,000, in the shape of repaving and maintaining payments.

I have nowhere seen any definite figures presented by the advocates of municipal ownership and control, so far as it relates to street railway properties, and I think, when these figures are arrayed, the gentlemen who advocate ownership and control will hesitate. Roundly stated, the street railway properties in the city of New York, and they are only a small portion of the franchises proposed to be taken, can be purchased for about $295,000,000. I hardly think that, in the present state of the public's mind, there is any likelihood that the city of New York will take upon itself by purchase so great a burden, especially when it is coupled with the danger of expensive management and political opportunity.

* Abstract of Paper read before New York State Street Railway Association, September 14 and 15.



A Fuse Repair Kit.

A Fuse Repair Kit.

The Chicago Fuse Wire and Manufacturing Company, 154 Lake street, Chicago, and 853 Broadway, New York, have placed on the market the Chicago fuse repair kit, illustrated herewith. This device is substantially made of brass tubing, finely nickel-plated, with screw caps, and with a button placed about one-third the distance from one end. In the short end are placed fuse links, assorted, as may be desired. The long end accommodates the magazine containing five sizes of fuse wire, each on a separate spool, and which may be changed simply by removing a spring key at one end. The repair kit entire, loaded, weighs one pound, which is the weight of one ordinary spool of fuse wire. The benefits to the lineman and repair-man of this holder will be apparent at once, as it enables him to carry small amounts of a number of different sizes of fuse wire, also an assortment of fuse links, and all contained in a receptacle, which is at once convenient and light, and which prevents the fuses from becoming damaged when thrown together with tools, etc., in the ordinary tool bag.

How to Become an Electrical Engineer in England.

The London *Electrical Engineer* recently offered a prize of two guineas for the best letter of advice to the parents of young men wishing to become electrical engineers. The prize was awarded for the following contribution, signed "An Electrical Engineer." The writer states that his letter is a *résumé* of his own career, which has led to a good appointment. His letter of advice follows:

One great principle that is necessary to success in any trade or profession is that any person entering such should do so of his own free will. Far too many young men go into, or are sent into, the engineering trade when they would make better ministers or soldiers, but as engineers they remain failures, because the whole soul is not in the work. The young engineer must be strong and in fit condition to do hard work. He must be willing to get up regularly at 5 or 5 30 each morning, and above all he must be ready at all times to obey his superiors.

If a boy shows a desire to become an engineer, he should be kept at school till he is 16 or 17 years of age. The last few years should be spent at an ordinary commercial college, where he will get a good general education, which is absolutely necessary to success. On leaving college he should have a good knowledge of geometry, algebra, trigonometry, freehand drawing, physics, inorganic chemistry, magnetism and electricity, practical plane and solid geometry. He should at least have gone through the elementary stages of these. He may now be got into a general engineering shop, where from 20 to 30 hands are employed. Never start in a large shop. In a small shop a lad of the better classes will usually find his fellow-workmen of a lower grade than himself, but he will soon get hardened to that. He may get many odd jobs to start with, such as tending the boiler and engine, or hammerman to the blacksmith, but at such things he will learn a lot. After a few weeks he will get accustomed to his surroundings, and will have started on fitting and erecting. In small shops fitters learn to use all the machines—such as milling, planing, drilling, slotting, shaping, etc. One great advantage that a small shop has is that apprentices learn to make their own tools, and to do all sorts of blacksmith work; small shops usually do a great deal of outside repairing work, where a great knowledge can be gained amongst all classes of machinery. This will be found of very great advantage afterwards After about three years on the fitting he will get on to the turning. In small shops, from five to eight turners (usually apprentices) are employed, so he will have all classes of work to do, such as screw cutting, shaft turning, boring wheels, pinions, bearing blocks, turning crank-shafts, and a lot of other jobs too numerous to mention, both light and heavy. Parents will say that the foregoing is not electrical engineering, but the electrical engineer first requires to be a thorough mechanical engineer. Four or five years might be spent in such a shop as the above, the pay ranging from 3s. 6d. to 16s., all depending on the shop, district and experience of the apprentice. During the foregoing apprenticeship the following classes should be attended: Mathematics, machine drawing and design, steam, applied mechanics, inorganic chemistry, mechanical engineering, statics and dynamics, physics. He should also learn to use the slide rule, which is now in constant use in all offices where calculations have to be done.

The young engineer should now have little difficulty in getting into an electrical works, where he should remain for one or two years. His training would now depend on the circumstances of the parents, but it is not advisable to pay a premium, as it is apt to induce laziness and insubordination in the apprentice. Before starting in an electric shop the apprentice should consider which branch he is to take up, for it is necessary to make a specialty of one branch and stick to it. Different branches are the manufacture of dynamos, motors and electric power plant generally; also high-speed engines. Another branch is the manufacture of electrical fittings. A specialty is also made in wiring and lighting buildings and vessels. After a year or two in an electric shop the young engineer should get into an office where a specialty is made of the line he wishes to take up. It is rather difficult to get into an office, and if the parents can pay a remuneration it will make matters easier. Several electrical firms in this country do not take premiums, and the best men in their shops usually get into their offices. These firms also pay at least a living wage on starting in their offices. In the office a start will have to be made on tracings and easy pieces of design, and as the man progresses he will get dynamos and motors to design; also high-speed engines, switchboards and resistances, all depending on the firm he has started with. He should also learn to estimate and draw up specifications, both for light and power installations. The great object aimed at nowadays is to produce the best results with the least cost, and this has usually to be done in a specified time.

In conclusion, I can not do better than quote from Southam's "Electrical Engineering as a Profession and How to Enter It." The management of works, organization of factory and men, negotiations, the part taken by the board of trade, the local board, and municipal authorities in helping or restricting engineering work, the outlooks in various branches of industry in various countries, the cultivation, not only of knowledge, but sharpness and the sense of responsibility, all these are learnt, not at college, but by apprenticeship with a firm. This is also the view held by all the leading electrical engineers of to-day.

The Brush Apparatus.

The sale of the apparatus of the Brush Electric Company is larger to-day than it has been for a long time, and is constantly increasing. Although this company, as is well known, is in close touch with the General Electric Company, it has not gone out of existence by any means, and its product will always possess an individuality and merit peculiarly its own. No electric lighting apparatus that was ever manufactured has stood the test of use and time better than that turned out by this pioneer company under the patents of Charles F. Brush.

The Massachusetts Board of Railroad Commissioners has authorized an increased issue of stock to the Bridgewater, Whitman & Rockland Street Railway Company to the amount of $85,000, to be used in constructing 11 miles of new road-bed.

STREET RAILWAYS.

ABSTRACT OF THE ADDRESS OF PRESIDENT G. TRACY ROGERS, OF BINGHAMTON, N. Y., AT THE 15TH ANNUAL MEETING OF THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, NIAGARA FALLS, SEPTEMBER 14.

The past year will long be remembered by those connected with street railroads, in many cases, as one of the most discouraging since the adoption of rapid transit. Trade and commerce have, we hope, reached their lowest ebb. The bicycle is now our too successful competitor. It operates without franchise of track, and pays no taxes. On the contrary, cinder paths are constructed, pavements laid down, and in many cases pavements changed for its benefit. As a means of locomotion, the bicycle has come to stay; but, as a novelty, it is being overdone, and will share the fate of other novelties, and I believe has reached its zenith.

Notable improvements have been made recently in motors and car construction, especially for the suburban and interurban roads. Cars with all the comforts and conveniences of a steam passenger coach are now in operation on some lines.

The legislature and New York city officials have been dawdling with the question of rapid transit for a number of years, but whatever results have been accomplished in this direction may be attributed to the enterprise of the railroad companies. They have recently obtained the consent of the State Board of Railroad Commissioners to adopt electricity instead of horse-power over a distance covering 110 miles of track. This change involves an expenditure of $12,000,000, and I am informed that contracts have already been made for a large portion of the work. Contracts also have recently been closed between the Brooklyn Bridge trustees and the Brooklyn surface roads, by which the trolley roads of Brooklyn will extend their lines across the bridge. This great improvement will cost the Brooklyn roads $500,000.

Nothing has been done within the past 10 years which has inured more to the benefit of the people of our State than the adoption of rapid transit and the consolidation of street railroads in cities, both large and small.

Consolidation, which was at one time regarded as a menace to public welfare, is now universally recognized as redounding to its advantage.

It is far within the bounds of truth to say that for every dollar invested in a street railway, another dollar has been given to the people through the resulting increase in property values alone. The street railways have handsomely repaid the public for their franchises. The rapid increase in the number and size of parks and pleasure resorts owned by street railway companies and operated by them as traffic promoters has been one of the striking developments which have accompanied the introduction of electricity as a motive power on street railroads. The general opinion of street railroad managers, who have had experience in this direction, is that such pleasure resorts properly conducted, with a judicious selection of amusements and entertainments, tend to increase the ordinary traffic of the road. An amusement league for the interior cities of the State has been suggested. The idea is worthy of consideration, and, if properly handled, should be a saving and convenience to the roads in such cities.

The experiment of carrying United States mails has proved a success, and the postal-car service on our roads is appreciated by the public and accepted by the government. New freight and express routes are being established, which operate, not only as a convenience to the people, but as feeders to the steam roads.

The application of electricity to the existing steam roads is, to-day, a question of great importance to the practical railroad man. We have, no doubt, made inroads into their local passenger receipts, and probably will continue to do so. Our roads are so situated that in most instances we are at an advantage. We can operate at a much less cost than they, and our depots are at our patrons' doorsteps. The convenience and cheapness of our transportation recommend themselves. I believe there is room for us both, and, in a measure, the electric roads are a feeder to the steam roads, and the more closely they are allied, the better for both.

It is still a question as to whether the storage battery is becoming a practical factor in the operation of our roads, and whether at the present cost we can use it to advantage in our central stations and at the ends of our feeders, thereby assisting in maintaining the potential on the trolley lines. Compressed air and the many other powers now being tried may have some surprises in store for us.

The results of these experiments and inventions may be the beginning of a new era in the street railway world.

American Institute of Electrical Engineers.

The 118th meeting of the institute will be held at 12 West Thirty-first street, New York city, on Wednesday, September 29, 1897, at 8 o'clock P. M. The report of President Crocker as delegate to the National Conference on Standard Electrical Rules has been made to the council. This report on "The National Electrical Code" has been referred by the executive committee of council to the institute for discussion, and such action as may seem desirable. Copies of the code will be mailed by the secretary to members who may wish to participate in the discussion.

At this meeting an opportunity will be afforded for discussing the general bearing of this code upon electrical engineering.

A meeting of the western members will be held at Armour Institute, Chicago, on the same date and hour, September 29, 1897, 8 P. M., at which the above report will also be presented for discussion.

Sale of Arc Lamp Patents.

At Newark, N. J., on September 29, the title of the old Electric Construction and Supply Company in a number of Barton B. Ward's arc lamp patents will be disposed of at auction. A number of other assets of the company still undisposed of will also be sold by the receiver, Mr. Chauncey G. Parker.

The new line of the Staten Island Electric Railway to Bull's Head has become known as "the Klondike branch," owing to the enormous traffic already picked up. The service established at first has been doubled, and even at that nearly every car is loaded to the limit.

New "Paragon" Power Motors.

Mr. J. P. Williams, who designed the "Paragon" fan motor, which has been most successful during the past season, has adopted the same principles of construction in a series of small power motors, in sizes of one horse-power, one-half, one-quarter, one-eighth, one-twelfth.

These motors are completely iron-clad, with the exception of the pulley, with circular field and toothed armature. The new motors are made with an iron base, having edges turned upwards to form the oil pan. Radial brushes are used, the pressure of which is adjusted by a screw and lock-nut. The remarkable feature in connection with this type of motor is the magnetic circuit, low air-gap reluctance, etc., making the motor light in weight and very efficient for the size, the weight of the one-half-horse-power machine being only 60 pounds.

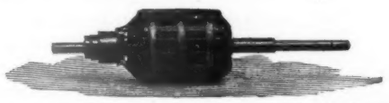


FIG. 1.—THE "PARAGON" COMMUTATOR, 1898 TYPE.

FIG. 2.—THE "PARAGON" ONE-SIXTH HORSE-POWER MOTOR, 1898 PATTERN.

FIG. 3.—INTERIOR VIEW OF "PARAGON" ONE-QUARTER HORSE-POWER MOTOR

FIG. 4.—ONE-QUARTER HORSE-POWER "PARAGON" MOTOR, 1898 PATTERN.

The motors are also made up as small size motor-dynamos for the generation of alternating currents from direct currents. This line of machines will be introduced by Mr. J. P. Williams, 39 Cortlandt street, New York, who is general agent for all the Paragon apparatus.

Air Ship News.

The *Electrical World* is awake again after the Summer solstice, and is after its old rival, the *Electrical Engineer*, and it's all on account of that De Bausset air-ship story the latter journal printed recently. According to the *Engineer*, the air-ship is a great floater and a goer. According to the *World*, the body of the ship will flatten out like paper before it leaves the ground. The ELECTRICAL REVIEW hasn't had much to do with the air-ship problem, as exemplified by Dr. De Bausset, since that gentleman asked us some years ago to describe the ship and accept a free pass on the first trial trip. Manhattan Island has an attraction of great magnetic force for us when air-ship inventors are "pirootin'" around.

Maj. Moses P. Handy, United States Commissioner, telegraphs from Paris that he expects the electrical exhibit from the United States at the French Exposition of 1900 to be a very large and representative one.

The Sprague Electric Railway Test at Schenectady.

Among the many events connected with the visit of Lord Kelvin to the great works of the General Electric Company, at Schenectady, N. Y., none possessed more interest to the electrical railway engineer than the acceleration test made upon the experimental track which runs along the heel path of the Erie Canal for a distance of nearly two miles.

The car used was one of the familiar American elevated railway type, provided with four 50-horse-power, 500-volt, 90-ampere motors, known as general electric 57's, mounted two on each of the trucks. On each armature shaft was a 33-toothed pinion meshing into a 52-toothed gear fixed to its respective axle. The total weight of the loaded car was 25 tons, including trucks, motors and passengers.

At present, owing to the long distance which must be covered by elevated railways, and the frequent stops and starts resulting from the nearness of stations, the question of quick starting and stopping has become a serious matter. Quick stopping is, however, well taken care of by both air and electric brakes, leaving rapid acceleration as the point needing attention. Realizing this, the General Electric Company has been experimenting for the past several months, in its usual quiet but progressive way, with the idea of determining at what rate of acceleration the passengers would be annoyed.

As a starting requirement Mr. W. B. Potter, chief engineer of the railway department, assumed that an acceleration of three miles per hour per second would not be unpleasant, and the car was equipped, as already explained, to prove or disprove the assumption. The only departure from ordinary practice was to reduce the gear ratio and use a controller which would admit sufficient current to give the required starting torque. In some of the previous runs the car had attained a speed of 28 miles per hour at the end of 10 seconds, while on the test under consideration the car was moving at the rate of 30 miles per hour at the end of 10 seconds. On this particular run, five seconds after the controller handle was moved the car had attained a speed of 19 miles per hour; at the end of 10 seconds, 30 miles per hour; 15 seconds, 35 miles; 20 seconds, 38 miles; and in 25 seconds, or five seconds less than a half minute, a speed of 40.5 miles had been attained.

These figures convey no real idea of the rapidity of the start. However, a comparison with acceleration on steam roads may serve to bring out this point. An ordinary train seldom exceeds a speed of 10 miles per hour at the end of 10 seconds; just one-third the speed attained in the same time by the test car. In a similar test of a regular Manhattan Elevated train at the end of 20 seconds the speed was only 13.5 miles per hour, during which time 198 feet had been covered, as against 38 miles and 556 feet in the case of the electric car.

The sensation due to these rapid starts was not unpleasant, and as the starting was perfectly smooth those standing were inconvenienced no more than is now the case with the elevated trains drawn by the slower steam locomotives.

The party on the car during the test included: Vice-President and General Manager Merrill, of the Erie Railroad; Col. H. G. Prout, editor *Railway Gazette*; Chas. W. Price, ELECTRICAL REVIEW; Dr. Louis Duncan, Johns Hopkins University; Frank J. Sprague, J. J. Swan, *Engineering News*, and E. C. Bacon, general manager Canal & Claiborne Road, New Orleans; from the company, W. B. Potter, W. J. Clark, L. H. Parker, L. D. Tandy and several others.

There are rumors in the air that a large electric railway supply house is to be established in New York city.

An Experiment in Safe-Opening by Electricity.

TO THE EDITOR OF ELECTRICAL REVIEW:

I noticed a remarkable phenomenon in connection with my last experiment (referred to in your issue of September 8) while melting the hole in the chilled-iron cast safe. As the metal began to run, in six or seven minutes, I placed a pan of water to catch the molten droppings, and globules fell into the water and remained red and hot under water from 10 to 20 seconds, instead of blackening immediately as was expected, as if they fed upon and received life from the water. Is this a new "quality" of heat by electricity or is it simply "intensity?" I am aware that a jacket of steam is formed, but it will not keep molten metal alive if heated in the ordinary way. Let some one follow this cue and explain it.

Yours truly, JAS. H. HOWARD.

Boston, Mass., September 15.

PERSONAL.

Mr. Horatio A. Foster, the well known engineer and expert, of Buffalo, N. Y., visited New York city last week.

Mr. J. N. Bulkely, of the General Electric Company's power and mining department, of Schenectady, was a recent visitor to New York city.

Mr. Hiram S. Maxim, the American inventor, was the first man to pay a fare for the use of an electric cab when they began running in London a short time ago.

The recent death of Mr. Charles A. White, president of the Bibber-White company, of Boston, has necessitated the following changes in the personnel of the company: Mr. C. E. Bibber, formerly manager and treasurer, has been elected president, and Mr. E. L. Brown, formerly assistant treasurer, has been elected treasurer.

St. Lawrence Power Company.

The St. Lawrence Power Company, which is developing at Messena, St. Lawrence County, N. Y., a gigantic water-power scheme, on September 25 certified to the Secretary of State that its capital stock has been increased from $200,000 to $6,000,000. Half of this capital is to be preferred stock, entitled to seven per cent dividends. The principal office of the company is at 40 Wall street, New York city.

The Williams-Abbott Electric Company.

The Williams-Abbott Electric Company, of Cleveland, Ohio, manufacturers of telephone apparatus, are moving into larger quarters, and will hereafter be located right in the heart of the city. They will have greatly increased manufacturing facilities and expect to largely increase their business.

It is rumored that the copper wire drawers of the United States have formed a pool, and that Benedict & Burnham, of Waterbury, Ct., will retire from the business.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

DAVENPORT, IOWA—The Iowa Telephone Company is rebuilding its line between Iowa City and Cedar Rapids. The line between this city and Vinton and Independence will also be rebuilt.

OWENSBORO, KY. — The Cumberland Telephone Company is building a line from this place to Beech Grove, McLean County.

LA CROSSE, WIS.—The American Telephone Company has its line completed to St. Paul and also a line projected from Tomah, on the main line, to this city. This is now open as far as Sparta.

CHATTANOOGA, TENN. —The East Tennessee Telephone Company has finished a line to Benton, Polk County.

GRAND ISLAND, NEB.—The extension of the Nebraska Telephone Company's line between this city and Kearney has been completed, and the merchants and citizens of Grand Island can now converse with patrons at Alda, Wood River, Shelton, Gibbon and Kearney. The rates announced vary from 25 to 45 cents.

HUNTSVILLE, TEX.—The Huntsville Telephone Company is getting matters in shape for the putting in of their telephone plant, and expect to have same in operation by October 15.

RALEIGH, N. C.—A telephone line will be begun in a few days, connecting Kingston, Hookerton, Swan Hill, Greensville, Tarboro, Rocky Mount, Wilmington and New Berne.

FAIRMONT, IOWA—Citizens of this place have commenced to build a telephone between this town and Armstrong. There will be offices at East Chain, Silver Lake and Tanbassen.

SABINE PASS, JEFFERSON COUNTY, TEX.—The East Texas Telephone Company, of Beaumont, Tex., has a force of men putting up poles for the extension of their line to the new town of Sabine Pass. This company also contemplates putting in a local telephone system and electric light plant here at a very early date.

OTTUMWA, IOWA—Edwin A. Knapp, of St. Louis, has been granted a franchise by the City Council to put in a new telephone exchange here at once. It will be connected with the long-distance telephone of J. C. Hubinger, of Keokuk, and it is said to be a part of the system that Hubinger is putting in in southern Iowa.

BENTON, TENN.—The telephone line from Cleveland to this place has been completed.

GRAND ISLAND, NEB.—The extension of the Nebraska Telephone Company's line between this city and Kearney has been completed, and the merchants and citizens of Grand Island can now converse with patrons at Alda, Wood River, Shelton, Gibbon and Kearney.

Electric Light and Power.

TULLAHOMA, TENN.—E. J. Mitchell, of Huntsville, Ala., has been granted a franchise by the Board of Aldermen and Mayor, to operate an electric light plant in this city.

PHILADELPHIA, PA.—A Philadelphia firm has asked the Sellersville Borough Council for a franchise to operate an electric light plant in that town.

HARTFORD, WIS.—Rowell & Company, proprietors of the Hartford Plow Works, propose to establish an electric light plant in this city.

GLASGOW, KY.—The electric light plant recently destroyed at this place will be rebuilt.

SPRINGFIELD, TENN.—A fund is being raised here for the purchase of an electric light plant. Mr. Duke, of Paris, is interested.

PERRYSBURG, OHIO—Citizens of this place have decided by vote to expend $8,000 for an electric light plant and $22,000 for waterworks.

KNOX, IND.—An electric plant is to be established here.

ATHOL, MASS.—Albert E. McReel has the contract for an electric light plant at the Farley paper mill.

MUSCATINE, IA.—Magoon & Kincaid have been awarded the contract for building the power-house for the West Liberty electric light and power plant.

NEWTON, N. C.—Electric lights are to be established.

DEERING, ME.—The Sebage Power Company has purchased the plant of the Deering Electric Light Company, formerly owned by the Marsh Brothers, and will take charge shortly.

HOUMA, LA.—An electric light plant is to be established here shortly.

NEW LONDON, OHIO—An electric light plant is to be established in this city.

IRONTON, OHIO—An electric light plant will probably be established here.

DONALDSVILLE, LA.—A new electric light plant, to cost about $14,000, will be established.

LOUISVILLE, KY.—Aaron Kohn, chairman Board of Public Works, may be addressed concerning electric lights to be established throughout the city.

GLENS FALLS, N. Y.—The contract for lighting the village streets of this place has been awarded to the Glens Falls Electric Light and Power Company for a term of three years from September 1.

TUNKHANNOCK, PA.—The Tunkhannock Electric Light and Power Company have contracted with the Scranton Electric Construction Company for the erection of the plant that is to light the town. The plant is to cost nearly $15,000, which includes poles, wires and everything. It is expected to get it into operation about November 1.

CLAYTON, N. J.—Electric lights are to be established here.

New Electric Railways.

BRISTOL, PA.—The new Midway, Morrisville & Trenton Trolley Company has applied for a charter. The road will extend through the villages of Emilie, Fallsington, Morrisville and Trenton. The new line will connect with the Bristol & Langhorne Trolley Road, making a through line from Philadelphia to Trenton. Ground was broken to-day for the Newtown & Langhorne Trolley Road by Contractor Brubrecker, who will complete the road in 60 days.

ROCKVILLE, MD.—The Washington & Rockville Railway, to run from the terminus of the Georgetown & Tennallytown Line to Rockville—a distance of about seven miles, has been incorporated. Ample capital has been secured, and it is the purpose of the promoters to begin work in the near future and push the work rapidly to completion. The incorporators are H. Maurice Talbott, Wm. H. Talbott, Oscar T. Crosby and Julian H. Miller.

LAKE BLUFF, ILL.—It is expected that the electric railway will be in operation through here between Waukegan and Highland Park by January 1. Ground is to be broken soon.

ALBANY, N. Y.—The Albany, Helderberg & Schoharie Railroad syndicate is making final preparations for the construction of the new electric road.

ANDERSON, IND.—Work has been begun on the new Gas Belt Electric Railway line.

FORT WORTH, TEX.— Work will shortly be begun on the Galveston-Houston electric railroad line.

CLEVELAND, OHIO—A company has been formed to construct a new electric railroad from Bellefontaine to Lakeridge and thence to Silver Lake.

MORRISVILLE, VT.—An electric railroad is being constructed from Waterbury to Stowe. It is expected to have it in operation by December 1.

KANSAS CITY, MO.—Rev. S. D. Stephens and J. S. Chick are interested in a plant to build an electric railway to the Kansas City University from the terminus of what is known as the Chelsea Park line.

HILLSBORO, WIS.—An electric line is to be constructed between Union Center and this place.

CHICAGO, ILL.—Henry C. Payne, vice-president of the Milwaukee Electric Railway and Light Company, may be addressed concerning new electric line to be built from this city to Green Bay, Wis., a distance of 250 miles.

LOGAN, UTAH — Christian Garff has been awarded the contract, by the Hyrum City Council, for putting in an electric light plant in Blacksmith Fork Canyon to supply that city with light. The town will use about ten street lamps, and 700 or 800 lights have been contracted for by private parties. A company is being formed and stock is being taken by many of Hyrum's business men in the enterprise.

New Incorporations.

PRINCETON, ME.—The Lewis Island Electric Company has been incorporated for the purpose of generating, selling and distributing electricity for heating, lighting, manufacturing and mechanical purposes, with $5,000 capital stock, of which $2,010 is paid in. The officers are: President, Waldo W. Mercier, of Princeton; treasurer, John B. Mercier, of Princeton. Certificate approved August 8, 1897.

NEW YORK, N. Y.—The Transcontinental Railway Company has been incorporated, with a capital stock of $200,000,000, for the purpose of operating trains by electricity on an elevated road.

ELMIRA, N. Y.—The National Electrolytic Company reported to have filed certificate of incorporation.

BOSTON, MASS.—The Salem & Wakefield Street Railway Company has been incorporated, the directors being Col. Charles F. Woodward, James F. Shaw, E. M. Southworth, W. F. Clark, Albert Mansfield, Rufus H. Brown and Oscar I. Stowell. The road will connect with the Lynn & Boston Railroad in Peabody, and will run through South Lynnfield, along the Newburyport turnpike to North Saugus, where it will meet the tracks of the Wakefield & Stoneham road, to Wakefield. The length is six miles. The capital stock of the company is $75,000.

BELLEFONTAINE, OHIO — The papers of incorporation for an electric railroad from this city to Lakeridge, at the Lewiston Reservoir, about 13 miles, and for a loop from this city to Silver Lake, three miles west, were sent to Columbus to-day. The incorporators are: J. C. Brand, Jr.; A. L. Bevis, Vint Elliott and W. W. Fisher.

ROCKVILLE, MD.—Articles of incorporation have been filed with the Secretary of the State for the Washington & Rockville Railway Company. The object of the company is to build an electric railway from the western terminus of the Georgetown road to Rockville.

Business Troubles.

DETROIT, MICH. — The Detroit Electric Railway is reported to have renewed chattel mortgage for $3,000,000.

ASHLAND, NEB. — Ashland Mill and Electric Light Company is reported to have given chattel mortgage for $500 to A. B. Fuller, of the Flour Mill and Electric Light Company.

BROOKLYN, N. Y. — James H. Mason Company, electricians, are reported attached for $558.

ROCHESTER, N. Y.—The Summerhays Company, gas and electric fixtures, are reported to have made an assignment.

TACOMA, WASH. — The Tacoma Gas and Electric Light Company is reported to have applied for a receiver.

OAKLAND, CAL.—J. W. Bankhead, electrician, reported real estate attached for $60.

Kindred.... ...Interests

Severin Senator, of Berlin, Germany, is issuing circulars and pamphlets describing his line of incandescent lamps and electrical apparatus.

James Rawle, secretary of the J. G. Brill Company, of Philadelphia, is quoted as saying that the street car building business has increased materially in the last few weeks. The Brill works are running full. The greater portion of the business represents additional equipment for roads that have been in operation.

The New York Central & Hudson River Railroad, according to its annual report, carried over 23,000,000 passengers, during the past year, without the loss of a single life. From this it would seem to be safer to travel on the New York Central than to stay at home. It is equipped with modern electric block-signalling apparatus.

Stuart W. Wise, president of the Puritan Electric Company, of New York city, reports the discovery of a new disease, the result of nineteenth century advancement in science. This he terms the "Telephone Ear," caused in his case by the number of telephone inquiries received regarding the new Puritan alternating inclosed arc lamp.

Gale's Commutator Compound, manufactured by K. McLennan & Company, Marquette Building, Chicago, is meeting with an extremely large demand among users of electrical machinery. The O. C. White Company writes from Worcester as follows:

The sample of "Gale's Commutator Compound" which you sent us some days ago, we have given a careful trial, and we are much pleased with the results. It does absolutely all that you claim for it, entirely doing away with sparks and giving the commutator a clean, hard, polished appearance. We shall certainly continue the use of this "dynamo necessity."

The Western Electric Company, Chicago, have been manufacturing a very efficient battery for open circuit work. The carbon element is carefully made of the best selected material and the zinc is of the purest quality. The name given to this battery is "Economy," and is said to be indicative of its features as a producer of electrical current. When a purchaser sees the name "Economy" on his battery he may, the makers claim, take it as a guarantee of high grade. These batteries are made for the trade, and are carried in stock by many dealers.

The Garvin Machine Company, Spring and Varick streets, New York, have just issued List No. 20, of new and second-hand machinery, in stock for immediate delivery. The list of new machinery comprises, besides their own manufacture, many of the well known makes of lathes, planers, shapers, drill presses, presses and shears, grinding machines, and many miscellaneous machine tools, and special bicycle machines. The second-hand list is nearly as complete, and has also a number of their well known milling and screw machines listed, which are in as good condition as when new. The list will be sent to any one desiring one of them.

Maris Brothers, manufacturers of traveling cranes, of Philadelphia, Pa., are erecting a new machine shop to meet the demands of their increased business. The new building will be modern and designed to meet all the requirements of a handy and serviceable machine working establishment. The building will be 55 feet by 75 feet. Running the full length of the building will be a 10-ton power crane having a span of 30 feet. One side of the building will be arranged with a gallery, on which will be placed the lighter machinery. The framework of the building is of steel, and the covering of the sides and roof will be corrugated iron. The contract for the complete building has been let to the Berlin Iron Bridge Company, of East Berlin, Ct., who designed the structure, and who will furnish and erect all the material.

The Ridgway Dynamo and Engine Company, Ridgway, Pa., write that they are meeting with an increasing business indicative of the general improvement. Among recent orders they have received the following:

Schoen Pressed Steel Co., Pittsburgh, Pa., duplicate order, 50-kilowatt generator direct connected to 12 by 12 engine; New York & Pennsylvania Co., Johnsonburg, Pa., fourth order, 16 by 16 simple engine; Doylestown & Willow Grove Railroad, two 14 by 23 by 18 tandem compound engines direct connected to two 150-kilowatt generators; city of McComb, Ohio, one 50-kilowatt lighting generator; Cavanal Coal and Railway Co., Poteau, N. Y., one 13 by 14 simple engine; Knoxville Iron Co., Briceville, Tenn., one 16 by 16 simple engine; Hamilton & Co., Steel Works, West Newton, Pa., one 40-kilowatt generator; city of Milan, Tenn., one 13 by 14 engine; city of Opelousas, Tenn., one 14 by 14 engine; Black Diamond Coal Co., Coal Creek, Tenn., duplicate order, one 12 by 12 engine; Manning, Maxwell & More, New York city, 50-kilowatt power plant, including direct connected engine and generator; United Gas and Improvement Co., Philadelphia, Pa., one 10 by 10 engine; Scranton Electric Construction Co., Scranton, Pa., one 12 by 14 simple engine and one 17 by 18 simple engine; Pennsylvania Railroad Co., one 150 horse-power engine.

The Murray Iron Works Company, of Burlington, Iowa, has recently made the following sales and shipments of Sioux-Corliss engines and high-pressure tubular boilers: One 100-horse-power Corliss engine to the Lavaca Oil Co., Halletsville, Tex.; one 75-horse-power Corliss engine and 80-horse-power boiler to Rockford, Iowa, Electric Light Works; one 100-horse-power Corliss engine to Gustav A. Baumgarten, Schulenberg, Tex.; one 150-horse-power Corliss and one 60-horse-power to Brookfield Electric Light Co., Brookfield, Mo.; one 100-horse-power Corliss to Shannon & Mott Co., Des Moines, Iowa; one 125-horse-power Corliss to the Anchor Mill Co., Cedar Rapids, Iowa; one 100-horse-power Corliss and two 70-horse-power boilers to the city of Unionville, Mo.; one 100-horse-power Corliss and two 100-horse-power boilers to the city of Rock Rapids, Iowa; one 100-horse-power Corliss and two 100-horse-power boilers to Col. J. W. Blees, Macon, Mo.; one 80-horse-power boiler for the Lake Mills, Iowa, Electric Light Works; two 80-horse-power high-pressure boilers for the Oskaloosa, Iowa, Heat, Light and Power Co.; two 100-horse power high-pressure boilers for the Boone, Iowa, Electric Street Railway and Light Co.; one 80-horse-power high-pressure boiler for the Sioux City, Iowa, Water Works; two 100-horse-power high-pressure boilers for the Monmouth Mining and Manufacturing Co., Monmouth, Ill.; two 80-horse-power boilers for Wells & Nieman, Schuyler, Neb.; one 80-horse-power boiler for the Eldon, Iowa, Electric Light Station. The company is building a 600-horse-power cross-compound, direct-connected, condensing Sioux-Corliss engine for the San Antonio Tex., Street Railway Co. They are also doing a large business in mining engines and boilers for Mexico and the West.

$7,800 GIVEN AWAY

To persons making the greatest number of words out of the phrase "Patent Attorney Wedderburn." For full particulars, write the National Recorder, Washington, D. C., for sample copy containing same.

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The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 8 P. M., October 7th, 1897.

C. C. MCCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 21, 1897.

590,238 Electric arc lamp; W. R. Ridings, Birmingham, England — A brake mechanism for an electric arc lamp comprising a friction wheel, a set of toggle levers, a pad carried at the point of the toggle levers, electro-magnetic devices for operating the levers to cause the pad to clutch or engage with and leave the wheel, and connections between the wheel and the carbons.

590,263 Electric measuring apparatus; J. C. Henry, Denver, Colo.—Consists of two electric motors driving a single vehicle, two coils connected respectively to the circuits of the said two motors, and a magnetic indicating instrument acted on by both of said coils.

590,267 Electric alarm; J. C. Kenmouth, Spearfish, S. D.

590,296 Indicator for cars; W. F. Bucher, Philadelphia, Pa

590,299 Signal mechanism; J. P. Coleman, Swissvale, Pa.—Consists of a signal having a bias to danger position, an electric motor, an electrically controlled connection between the motor and signal, and a motor brake mechanically released by the signal.

590,300, 590,301, 590,302, 590,303 Signaling apparatus. J. P. Coleman, Swissvale, Pa.

590,304 Common battery multiple switchboard; H. M. Crane, Boston, Mass.

590,310 Electric railway; R. M. Hunter, Philadelphia, Pa.—An electrically propelling vehicle having a frame supported upon the axles or axle boxes independently of the springs supporting the car body with a horizontally movable collector arm hinged thereto, a collector wheel journaled upon the free end of said arm and a working conductor upon which said collector wheel runs.

590,386 Electric trip-knife-switch; A. C. Carey, Lake Pleasant, Mass.—In a knife-switch the combination of contact posts and tilting knife carrier, with a tilting device comprising a lever having a spring connected with the knife carrier and provided with projecting fingers, and spring stops provided with stop lugs which engage angles on the knife carrier positively to support the knife carrier in either of its tilted positions

590,398 Electric signaling; S. De Jager, Paterson, N. J.—The combination of a transmitting device comprising means for sending a predetermined number of impulses of one polarity followed by an impulse of the opposite polarity, a main line, a source of electricity, a selecting device comprising two or more groups of magnets, contacts controlled thereby, and a receiving device controlled by the magnets.

590,407 Temperature-regulating apparatus; H. R. White, Arlington, Mass.

590,420 Electric railway; R. Lundell, Brooklyn, N. Y.—A switch box provided with a mud groove near its top, with a cover provided with two downwardly extending flanges, one of which is adapted to rest in the mud groove and the other to surround the switching mechanism when the cover is located in position.

590,427 Coin-operated electrical apparatus; W. B. Wheeler, Lincoln, Neb.

590,466 Commutator and means for assembling same; S. H. Short, Cleveland—A hub, or spider, a commutator cylinder mounted thereon, and an expansible ring interposed between said commutator cylinder and said hub.

590,497 Electrical igniting device for lamps; S. M. Meyer, Brooklyn, N. Y.—A central draft lamp and a high-resistance electrical conductor located adjacent to the upper end of the wick tube, and attached to and supported by the air-distributor.

590,552 Electric railway; J. A. Roche, Chicago, Ill.

Do You Want Gold?

Every one desires to keep informed on Yukon, the Klondike and Alaskan gold fields. Send 10 cents for large compendium of vast information and big color map to Hamilton Publishing Company, Indianapolis, Ind.

THE ANNUAL MEETING OF STOCKHOLDERS of the ELECTRICAL REVIEW Publishing Company will be held on Saturday, October 9, 1897, at two o'clock P. M., at the offices of the company, 41 Park row, New York city, for the Election of Directors for the ensuing year, and for the transaction of such other business as may come before the meeting.

New York, September 28, 1897.

STEPHEN L. COLES, Secretary.

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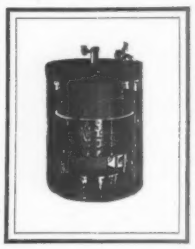

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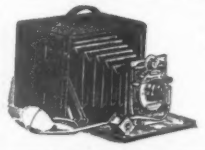

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